AMERICAN GAS JOURNAL

FEBRUARY 1941

Living up to its name and heritage . . .

The EMCO "1001" REGULATOR

EMCO "1001" Regulator

THE inception of the EMCO "1001" Regulator was brought about by the demands of the industry for the utmost precision in pressure control applied to the widely varying requirements of the gas distributing companies. The unprecedented acceptance of this unit during the short period since its introduction indicates that the "1001" regulator has fully lived up to expectations.

This regulator is designed to provide accurate control for installations having both small and large flow rates, where supply pressures ranging up to 150 lbs. must be reduced to 20 lbs. or less. In this category are large gas appliances, boiler plants and industrial heat-treating furnaces. The EMCO "1001" Regulator is also well suited to small town border station requirements and may also be employed for district regulator installations where systems are operated at intermediate pressures or at intermediate and low pressure combined.

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PRINCIPAL APPLICATIONS

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Eliminates any occasion for pressure complaint from this very important group of consumers.

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FOR MORE ACCURACY IN MEASUREMENT
Finally solves an ever reoccurring problem.

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"Greatest Contribution to the Water Gas Industry since the Introduction of the Backrun"

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	3.	8' 0"	New	520	100% Bituminous and Bunker C Oil
	4.	12' 0"	New	800	Coke and Gas Oil
	5.	10' 0"	New	535	Coke and Bunker C Oil
	6.	7' 0"	Conversion	530	100% Bituminous and Bunker C Oil
	7.	10' 0"	New	535	Coke and Bunker C Oil
	8.	10' 0"	Conversion	540	100% Bituminous and No. 5 Fuel Oil
	9.	9' 0"	New	535	100% Bituminous and No. 5 Fuel Oil
	10.	7' 0"	New	535	Anthracite and Gas Oil

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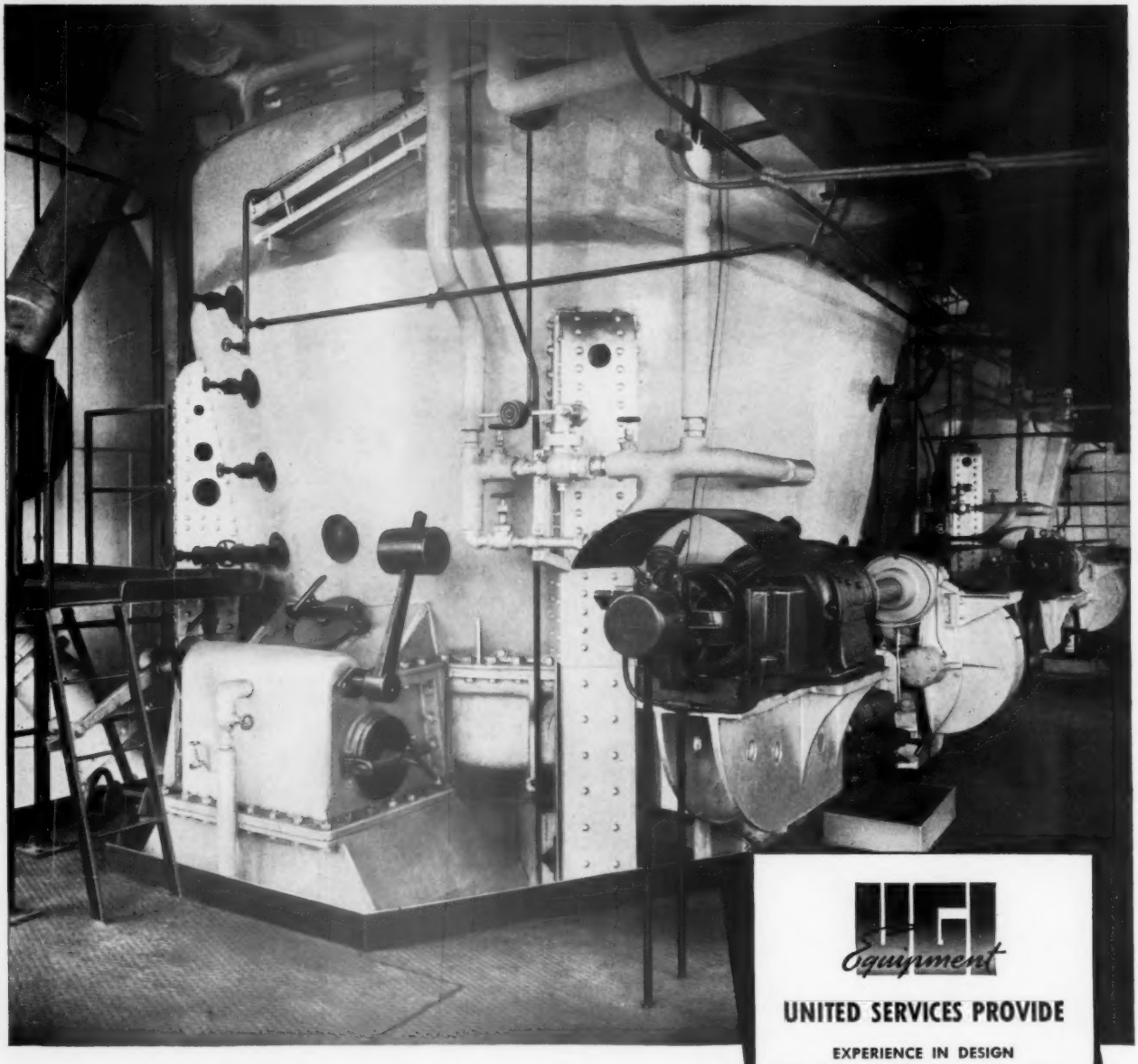

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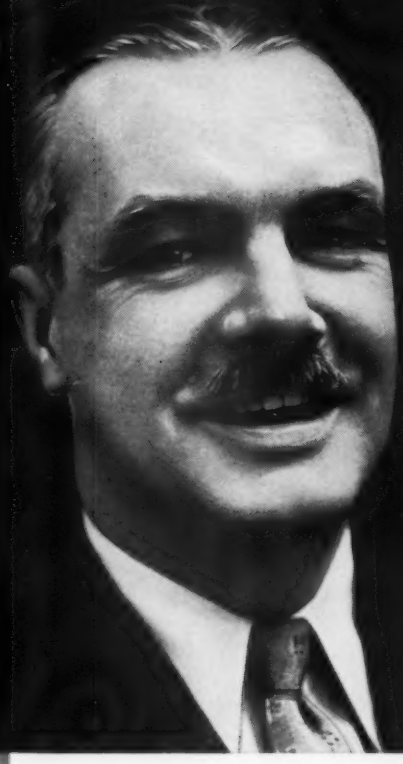

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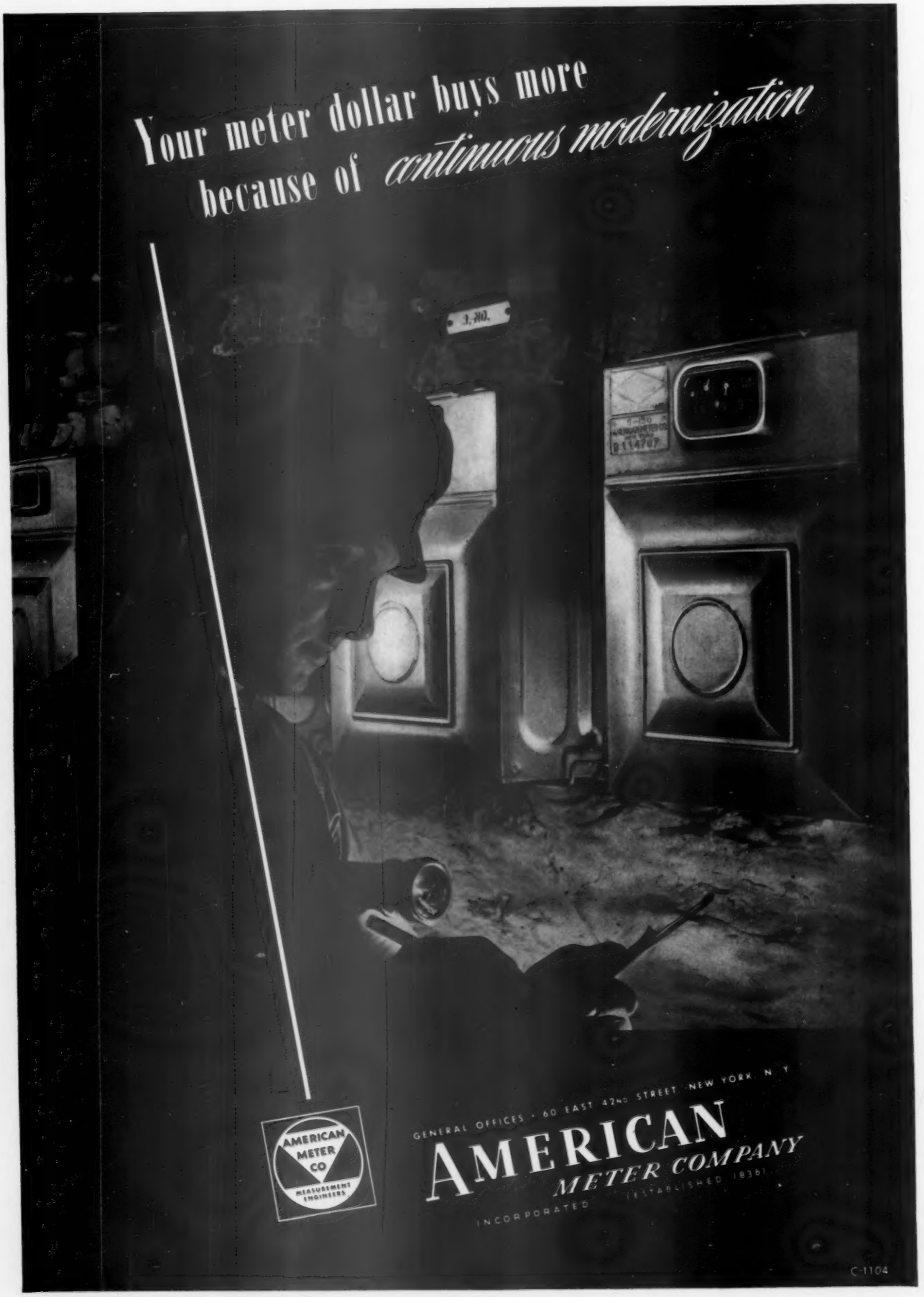
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No. 2

AIR HUMIDITY

What it is and How it Acts

Part 1

By

O. J. Kuenhold,

Humidification Engineer
Monmouth Products Company

THE importance of proper air humidity in heated homes is becoming recognized more each year. Proper room temperature involves *bodily* comfort while proper air humidity involves *breathing* comfort. Modern heating science recognizes the importance of both bodily comfort and breathing comfort. A proper combination of room temperature and air humidity results in the most healthful conditions. To rehumidify air after it is warmed and consequently dried, is to health-condition the air.

Because of the importance of humidification in modern heating, everyone connected with the heating industry should know what air humidity is and how it acts. This applies to heating contractors, engineers, salesmen, as well as architects and builders. Many of the things they now know about humidity are wrong. This series of articles aims to explain the real facts and promote a correct understanding of air humidity in a non-technical thorough and interesting way and in particular to clear up the wrong ideas about humidity that are almost universally held.

Air is a gaseous mixture always containing some water in the form of an invisible gas, called "water vapor" which is so to speak, "dissolved" in the air. The amount of water vapor which air can contain in "dissolved" condition depends upon the air pressure and temperature. The variation in atmospheric pressure at the earth's surface is, however, too small to have sufficient effect to require any further consideration in this article.

The influence of air temperature upon the amount of water vapor that air can contain is considerable. This is graphically shown by the upper curve in chart I. The vertical lines indicate various air temperatures from 0° to 90° Fahrenheit. The vertical distance from the base line to the "saturation line" indicates proportionately how many grains of water vapor each pound of air can hold "in solution", the exact number of grains being given. Note that at 90° each pound of air can hold 218 grains while at 0° it can hold only 5.5 grains. At 70° each pound of air can hold 110.5 grains—20 times as much as at 0°.

The water vapor content of air is given in grains per pound of air, instead of per cubic foot, because by giving the quantity of air in pounds we need not consider its expansion or contraction under temperature change. At 70° a cubic yard of air weighs close to two pounds. A grain is one 7000th of a pound. A drop of water weighs about 4 grains. The above enables you to get an idea of what is meant by a pound of air or a grain of moisture.

When air holds all the moisture it can hold in gaesous form it is said to be 100% saturated. When the air holds 50% or 35% of the water vapor it can hold at any given temperature then it is respectively 50% or 35% saturated.

The weight of water vapor that air holds when 100% saturated is a very small per cent of the weight of the air. These percentages are given at the upper end of the temperature lines in chart I. For instance, at 70° the most water vapor that air can absorb forms only 1.6% of the air. At 35% saturation this will be less than 0.6%.

When more moisture than the air can absorb at its temperature is injected by a water spray or steam jet, the surplus will be in the form of a visible mist and this will deposit in ducts or on other surface. If air is cooled so that at its reduced temperature it cannot hold all the water vapor it originally contained, the surplus will assume an "undissolved" mist form. For example: if air at 80° containing 84 grains of water vapor per pound is cooled to 50° when it can absorb only 53.5 grains per pound (see chart I) the surplus of 30.5 grains will condense as a mist.

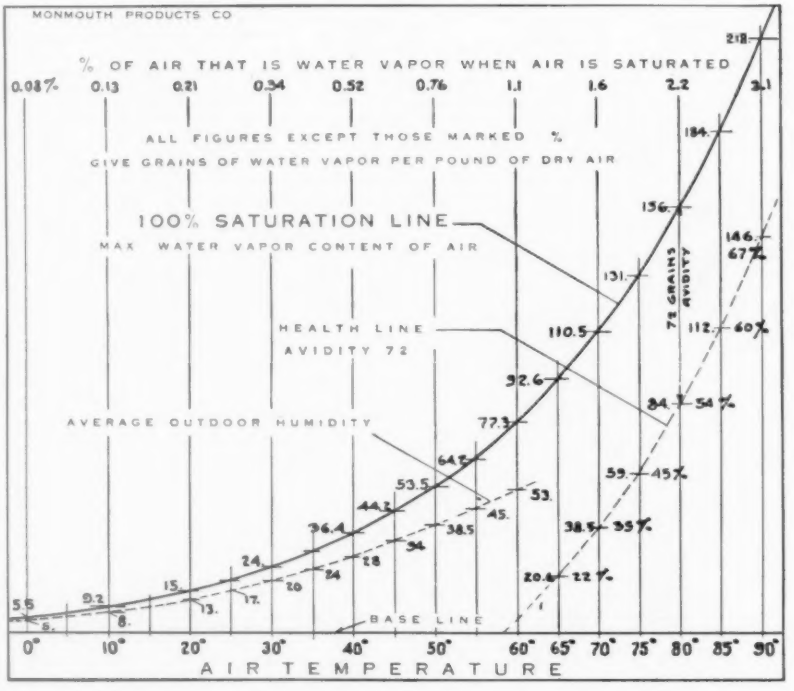
In our consideration of air humidity we are concerned only with the water vapor that air can fully absorb as an invisible gaseous vapor. In other words, we shall only consider air that is 100% or less than 100% saturated. This per cent of saturation is commonly called the "relative humidity" of the air.

Originally the term "relative humidity" was employed by scientists as a basis for making various calculations. But when humidification became popular, the expression "relative humidity" was adopted for popular use but in such use its true meaning and purpose was entirely lost. Relative humidity seems to mean comparative air moistness and the general public accepts it to be the sole and complete measurement of how moist or dry, how much water vapor the air can impart or absorb and how harmful or healthful the air is. The general public, the heating industry and even physicians and heating engineers commonly speak of the per cent of relative humidity as though at a given per cent of humidity, the properties of the air with regard to moisture are the same regardless of its temperature. It is generally assumed that air at 35% relative humidity, for instance, is equally dry at 60° or 80°. The actual fact is that the air in the above example is more than twice as dry at 80° as at 60° and yet the relative humidity is exactly the same (35%) in both cases. This illustrates how very misleading the term "relative humidity" can be as it is commonly and wrongly used.

The term "relative humidity" is merely a mathematical term denoting the ratio between the water vapor that the air actually holds and the maximum water vapor it can hold. It means absolutely nothing until we also know the temperature of the air, when we can use the relative humidity as a basis to calculate how much water vapor the air contains. But even if we know how many grains of moisture each pound of air holds, we still do not know the characteristic of the air that is most important in humidification, namely the activity of the air in extracting moisture from walls, ceiling, floor, woodwork, furniture, carpets, drapes, varnish, etc., and from the skin, hair, eyes and breathing passages of humans.

As a matter of fact we are not directly interested in the per cent of saturation of the air or how much water vapor it contains. The vital point is "how much *more* moisture can the air hold." It is the capacity of the air for absorbing *more* moisture that counts. This measures its avidity for moisture.

CHART I


MONMOUTH PRODUCTS CO
% OF AIR THAT IS WATER VAPOR WHEN AIR IS SATURATED
0.08% 0.13 0.21 0.34 0.52 0.76 1.1 1.6 2.2 3.1
ALL FIGURES EXCEPT THOSE MARKED % GIVE GRAINS OF WATER VAPOR PER POUND OF DRY AIR
100% SATURATION LINE
MAX WATER VAPOR CONTENT OF AIR
HEALTH LINE
AVIDITY 72
AVERAGE OUTDOOR HUMIDITY
72 GRAINS AVIDITY
BASE LINE
AIR TEMPERATURE
0° 10° 20° 30° 40° 50° 60° 65° 70° 75° 80° 85° 90°

In order to properly and fully understand air humidity we need a new term to express and directly measure how avid the air is for moisture. The writer hereby presents such a term to be called the "moisture avidity" of the air. This will tell how many additional grains of water vapor each pound of air can absorb, over and above the water vapor it already holds. We will thus have a direct and accurate measurement of the moisture absorbing or drying power of the air at any temperature and per cent of saturation or relative humidity.

Table I gives the moisture avidity for various temperatures and per cents of saturation opposite the per cent of saturation at the right and below the temperature. For instance at 70° and 35% saturation each pound of air can absorb 72 additional grains of water vapor. This 72 is its moisture avidity.

An inspection of Table I will disclose a number of surprises, all of which will be very enlightening however. For instance in 80° summer weather and at 55% relative humidity which is usual in summer, you will find the air avidity at 70 grains. Avidity in the vicinity of 70 grains is, as a matter of fact, just about ideal. Note that at 70° room temperature you should add sufficient water vapor to the air to reduce the avidity to about 70. This will be at about 35% relative humidity, which is about ideal for 70°.

If we could feel comfortable at 65° we would only need to have 25% relative humidity at which the avidity is 70. But if, because of the very light clothing that women wear, a room temperature of 75° is demanded then we must raise the relative humidity to about 45% to hold the avidity down to 72. Similarly, for 85° room temperature we would have to humidify up to about 60%.

Table I can also be used to tell us how avid air is for moisture at any given per cent of relative humidity. For instance, let us take 35% humidity and see what this actually means at different temperatures. Following the 35% relative humidity line across from the right-hand column we find that at 60° the avidity is 50; at 65° it is 60; at 70° 72; at 75° 85; at 80° 101 and at 85° 120. Note the great variation in moisture absorbing activeness, yet at all of these temperatures the relative humidity is the same, 35%. This very plainly shows that the relative humidity means nothing until it is interpreted into terms of moisture avidity.

The left hand column in Table I

TABLE I

PERCENT SATURATION - USE TO FIND MOISTURE CONTENT	AIR TEMPERATURE													PERCENT SATURATION - USE TO FIND MOISTURE AVIDITY
%	0°	10°	20°	30°	40°	50°	60°	65°	70°	75°	80°	85°	90°	%
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100
5	.27	.5	.75	1.2	1.8	2.7	3.9	4.6	5.5	6.6	7.8	9	11.	95
10	.55	.9	1.5	2.4	3.6	5.3	7.7	9.3	11.	13.1	15.6	18	22.	90
15	.82	1.4	2.25	3.6	5.5	8.1	11.6	13.9	16.5	19.7	23.4	28	33.	85
20	1.1	1.8	3.	4.8	7.3	10.7	15.5	18.5	22.	26.	31.	37	44	80
25	1.4	2.3	3.75	6.0	9.1	13.4	19.	23.	28	33.	39.	46	54	75
30	1.6	2.75	4.5	7.25	10.9	16.	23.	28.	33.	39.	47.	55.	65	70
35	1.9	3.2	5.25	8.4	12.7	18.7	27.	32.	39	46.	54.	65	76	65
40	2.2	3.7	6.0	9.6	14.6	21.4	31.	37.	44.	53.	62.	74.	87.	60
45	2.5	4.1	6.75	10.9	16.4	24.	35.	42.	50.	59.	70.	83.	98	55
50	2.7	4.6	7.5	12.0	18.2	27.	39	46.	55.	66.	78.	92.	109	50
55	3.0	5.0	8.25	13.2	20.0	29.	42.5	51.	61.	72.	86.	101.	120	45
60	3.3	5.5	9.0	14.5	21.8	32.	46	56.	66.	79.	94.	111.	131.	40
65	3.6	6.0	9.75	15.7	23.7	35.	50.	60.	72.	85.	101.	120.	141.	35
70	3.8	6.5	10.5	16.9	25.5	37.	54.	65.	77.	92.	109.	127.	152	30
75	4.1	6.9	11.25	18.1	27.	40.	58.	70.	83.	99.	117.	138	163	25
80	4.4	7.3	12.0	19.3	29.	43.	62.	74.	88.	105	125.	148.	174	20
85	4.7	7.8	12.75	20.5	31.	45.	66.	79.	94.	112.	132.	157.	185	15
90	4.9	8.25	13.5	22.	33	48.	70.	83.	100.	118.	140.	166.	196	10
95	5.2	8.7	14.25	23.	35	51	74.	88.	105	125.	148.	175	207	5
100	5.5	9.2	15.0	24.	36.	54.	77.	93.	110.5	136.	156.	184	218	0
%	0°	10°	20°	30°	40°	50°	60°	65°	70°	75°	80°	85°	90°	%
	AIR TEMPERATURE													

is used to find the number of grains of moisture each pound of air holds at various temperatures and per cents of saturation. For instance, at 70° and 35% saturation each pound of air will hold 39 grains of water vapor. At 100% saturation it holds 110.5 grains. Subtracting the grains of water vapor contained from those that each pound of air can contain, we get 71.5 grains of additional moisture that the air can hold. This is its moisture avidity at 70° and 35% saturation.

The mistake is frequently made of taking readings of the relative humidity in different rooms to determine how evenly the water vapor is distributed. The correct way to determine this is to obtain readings of both air temperature and relative humidity. When the water vapor is equally distributed it will contain an equal number of grains per pound at the various air temperatures. Use Table I to find the water vapor content of the air at given temperatures and relative humidity. For instance, assume room temperatures of 65°, 70° and 75° with 35% relative humidity in the 70° room, both readings taken at the same level and vicinity. Opposite 35% in the left hand column of Table I and in the 70° column, we find water vapor content of 39 grains. At 65° and 39 grains, the relative humidity will be slightly above 40%. At 75° and 39 grains the relative humidity will be 30%. Here again is illustrated how deceptive the term "relative humidity" is and that it must not be taken as the sole and exclusive index of humidity.

Be sure to understand clearly that to find how much water vapor the air contains, refer to the scale of relative humidity or saturation per cents in the *left hand* column of Table I. To find how much *more* water vapor the air can hold be sure to refer to the saturation per cents in the *right hand* column.

Reference to Chart I will help to give you a clear picture of what moisture avidity is. The distance from the base line to the 100% saturation line shows how many grains of water vapor each pound of air contains at each temperature. At a distance of 72 grains below the saturation line is the health line. The number of grains of water vapor absorbed by each pound of air and the % of saturation or relative humidity that this health line represents is marked for air temperatures ranging from 65° to 90°. These per cents of saturation represent equal moisture avidity or drying capacity at the temperatures given. Note the wide variation in per cent of saturation to give equal moisture avidity of 72 grains per pound of air.

A SUGGESTION

In view of probable increasing difficulty in securing deliveries of manufacturing materials, repair parts, etc. because of defense work, and possible future priorities and transportation congestion, it is suggested that each gas company review its local situation to determine

(1) Whether it should lay in and keep on hand a 90 day supply of coal, coke and oil.

(2) Whether it has on hand an adequate stock of repair parts for all essential plant apparatus and distribution facilities.

(3) Whether there are machine shop facilities within reasonable distance which can definitely be counted on for repair work. (A survey is strongly suggested. Machine shop facilities of near-by gas companies should be included.)

(4) Whether your own operating force is capable of making all minor repairs and has proper equipment such as welding torches, hand tools, etc. for doing so.

(5) Whether you have on hand an adequate stock of appliances, in view of the possibility that the plants of some manufacturers may be converted to defense work, in part at least.

Sales Approach for Government Projects

By
James F. Pitman
Lynn, Mass.

I ASSUME that when I was called on to present a discussion entitled "Sales Approach on Government Projects" that it was primarily for the purpose of gathering new ideas on this subject and it is my hope that what I have to offer will be of value.

In reality, this is a tough assignment considering that the gas industry has already demonstrated its ability to sell the potentialities of gas to government projects and I feel quite proud in having been singled out to furnish additional information.

It is a fact that the greater percentage of army camps are today using gas; therefore, it is very evident that the gas industry knows how to approach the government on these projects in view of their present accomplishments.

It was our undertaking at the start of the present emergency to sell the War Department on the idea of serving fried foods and using a gas-fired deep fat fryer in preparing these foods. We pride ourselves on having sold them this idea.

In the year 1940 we have shipped our equipment to 75 camps. Although we do not have the figure of the total number of new camps constructed in the past year, it is our belief that gas has been well represented in the entire program.

From our point of view the situation is as follows regarding automatic temperature controlled gas-fired fryers. An army camp chooses for its fuel:

Case #1: Coal for cooking, baking and water heating, and electricity for deep fat fryers.

OR

Case #2: All gas fuel and equipment.

For this reason we stress the real money value of gas as a fuel, all factors considered, because only on such a basis can we sell gas equipment on a government project.

This Defense Program has just started. It will necessitate a tremendous number of new projects for the housing of men who will have to be fed; and therefore, the requirements will be enormous for additional cooking and other equipment. It is our aim and it should be yours to be represented in as many of these projects as possible.

The manufacturers of equipment, especially those companies like ourselves, look to the gas industry to supply these projects with their fuel. If you fail and a competitive fuel is chosen, it would constitute a loss to all of us affiliated with the gas industry. It is needless to add that our competitors are expending as much effort to have their fuel adopted.

It was unfortunate that in 1940 there were three projects in this area on which gas was not specified. Gas was available in two of the locations and yet for some reason your fuel was not included in the specifications.

As a manufacturer, our task has been simple in comparison to the hard work and the combined efforts of the gas industry that must be expended if the contemplated new camps, forts and projects are to use gas for the operation of cooking appliances, water heaters, etc.

We should feel proud that we are associated with an industry whose fuel is playing and will continue to play a leading role in our rearmament program. There is an important place for gas in every camp, fort and training station that will house the young men of our country who have either volunteered or have been drafted under the Selective Service Act.

Fortunately, we are not in a period of war hysteria such as we experienced in 1917. Our government and army officials have assumed a definite responsibility to the young men who are coming into their care and are giving considerable time and thought to the proper housing, clothing and more especially the feeding of these men.

It is the food preparation for these projects that gives the gas utilities and gas appliance manufacturers an opportunity that should not be overlooked in supplying fuel and equipment to prepare meals for a menu which is far different from the past and more comparable to what the boys had at home.

The soldiers housed in training camps using gas-fired equipment may consider themselves more fortunate than if they were placed in a camp using some other fuel. Some of you probably remember Camp Devens during 1917 and 1918.

I make the above statement since you and I are well aware that gas and gas appliances will prepare a much better food than will any other fuel in respect to quality and flavor, whether it be roasted, broiled, baked or fried.

However, I am here to suggest a means of sales approach to the government so that gas may be the chosen fuel on any new project that might be planned for this year or in the near future.

Time is an important factor to be considered in submitting your proposal to government departments. Have your proposal informative and concise because the decision as to what type of fuel is to be specified is made by the authorities when all these fuel comparisons are in front of them. These decisions must be made as quickly as possible and do not allow any time for jockeying back and forth with counter proposals. Your first proposal must be complete as the War Department in Washington is one of the busiest places in the World today and our contribution is but a small part of the defense program.

In order to gain first hand information pertaining to these projects, it is necessary that a contact man be on the job. This man must know the workings of the various governmental departments so that he may secure, within the shortest possible time, all data pertaining to contemplated projects.

Those of you who are members of the American Gas Association have such a contact man employed by the A.G.A. who maintains headquarters in Washington, D. C. This man is in close contact with the various governmental departments. You and your company should avail yourselves of this representation. If you do not take advantage of his knowledge, you may find that your competitor's fuel has been accepted. You

Presented before The New England Gas Association, Industrial Division, Boston, Mass., January 17, 1941.

must understand that it is next to an impossibility to change plans after they have been made, for in these critical times speed is the essential factor.

You may be interested in learning that Mr. George W. Bean, Fuel Consultant of the A.G.A. in Washington, has written an article entitled "U. S. Fuel Facts". This article appears in the December, 1940 issue of American Gas Association Monthly. We take the liberty of quoting his last paragraph. "We are in daily contact with the officials handling these programs and can furnish detailed information on any project upon request from gas company officials."

In the event that you learn of a new project being contemplated in your area and you do not have any information concerning it, your first move is to contact the A.G.A. representative in Washington, D. C. in order that you may receive the proper information relative to your proposal. You should cooperate with the A.G.A. representative by furnishing as much specific information on the project as possible.

You should then submit your proposal to the Field Officer in charge in letter form, furnishing all the information and data that will enable him to know all the merits of your fuel for comparison with other proposals of competitive fuels that he might have on hand.

A copy of your recommendations should then be forwarded to the Fuel Engineer of the Engineering Department of the Q.M.C. at Washington, D. C. where it would be subject to his approval and acceptance. At the same time, you should advise your A.G.A. representative in Washington of your recommendations.

I do not believe that, in the past, the gas utilities seeking an additional load have furnished enough of the proper information to warrant their fuel being accepted and specified by the proper authorities.

The War Department or any other government agency needs all the information quickly and in a concise form so that a decision may be rendered immediately for prompt action. The theme of our Defense program is SPEED and the fuel suppliers and manufacturers who are first to submit the proper information acceptable to the government are apt to be more successful in securing the award.

It is important that you submit figures and data concerning the cost of gas per cubic foot, B.T.U. content of gas, etc. Incidentally, 40 cu. ft. of 535 B.T.U. manufactured gas is consumed per man per day for all cooking and water heating purposes. This figure, we believe, is much higher than for the civilian population. All this goes to prove that Uncle Sam is looking after his trainees better than ever before.

It would be a good policy to compare your cost with that of your possible competitors, coal or electricity. You have the information on your competitors' costs to deliver fuel, and we know that with all factors considered gas would be the selected fuel.

Your data should indicate the amount of gas that will be used each day as well as each meal, taking into consideration that any project using gas will have the following gas appliances in use; namely, ranges, deep fat fryers, bake ovens, toasters, coffee urns, steam tables, dish washers and water heating, with the possibility of space heating.

We have determined that a camp housing 1,000 men would consume approximately 40,000 cu. ft. of manufactured gas per day or an equivalent of 40 cu. ft. per man per day. This is a sizable load and it would be sound business policy on the part of gas utilities to expend every effort to have gas specified as a cooking and water heating fuel.

We have prepared the following chart and information which might be of assistance to you in compiling future proposals for government projects. You might feel that you could add to this information but this is merely a suggestion on our part.

Breakdown or Analysis of Cooking Load

	Per cent		*Cu. Ft. 535 B.T.U. Equivalent to 1 K.W.H.*		*Weighted Average Cu. Ft. per K.W.H.*
Top Burners	35.0	×	9.7	=	3.40
Ovens	20.0	×	16.7	=	3.34
Deep Fat Fryers	15.0	×	12.0	=	1.80
Steam Tables	12.5	×	10.2	=	1.27
Urns	12.5	×	10.2	=	1.27
Toasters	5.0	×	16.7	=	.84
	100.00				11.92

The ratio of gas to electricity for cooking is 11.9 cu. ft. per K.W.H. In water heating, this ratio is 10.2 cu. ft. per K.W.H.

Weighted Average—Cooking and Water Heating

	Percentage		*Cubic Feet Per K.W.H.*		*Weighted Average*
Cooking	29.7	×	11.9	=	3.54
Water Heating	70.3	×	10.2	=	7.16
	100.00				10.70

Weighted Average of 535 B.T.U. Manufactured Gas Compared to Electricity in Cooking and Water Heating

The amount of gas used in Army and Navy training camps will average 40⅓ cu. ft. per man per day for all purposes.

Of this amount 29.7% is used in cooking, 18.6% for hot water in dish washing and 51.7% for hot water to the barracks.

The ratio of gas to electricity for all purposes is 10.7 cubic feet of 535 B.T.U. per cu. ft. of gas per K.W.H. of electricity.

Tabulation of break-even costs on the basis of 10.7 cu. ft. of 535 B.T.U. gas equivalent to 1 K. W. H.

Electricity Cost Cents per K.W.H.	*Gas Cost per 1,000 Cu. Ft.*
.50	$ .47
.75	.70
1.00	.94
1.50	1.40
2.00	1.87
2.50	2.34
3.00	2.80

An Army camp housing 1,000 men would demand 40,333 cubic feet per day divided as follows:

Cooking (4 cu. ft. per man per meal)	12,000
*Hot Water, Dishwashing (1 Gal. per man per meal)	7,500
*Hot Water, Barracks (8⅓ Gals. per man per day)	20,833
Total	40,333

**Based on 2½ cubic feet of gas per gallon of hot water.*

The daily electric consumption to meet the same load is 3770 K.W.H. and as noted above should be ¾ cents per K.W.H. to compete with gas at 70 cents per M.

(Concluded on page 53)

Modern Steam Generation at the Waterbury Gas Plant*

By
Harold M. Kopp
Waterbury, Conn.

THE USE OF STEAM in gas plants dates back to the start of the gas industry. Even in the early days when coal gas was the only commercial gas being distributed, steam was a necessary agent for operating pumps, compressors, exhausters and engines for driving all sorts of machinery. Later with the advent of water gas, steam became one of the basic and most important materials in the manufacturing process. Until recent years, however, it is very doubtful if the boiler plant has had very much consideration. Usually, in the smaller gas plants at least, the boilers have been put in some handy corner without much thought as to cost of fuel handling or even boiler efficiency. The boilers in more common use are of the fire tube type known as horizontal return tubular or abbreviated as H.R.T. boilers.

For general use in gas plants of smaller size these H.R.T. boilers are very satisfactory providing they are set high enough for good combustion characteristics. They are also being equipped in recent years with automatic stokers and oil burners. In most cases these boilers give very good service and it can be said that, with the exception of the settings, the maintenance is low. With poor water conditions that exist at many gas works, it is often found that the H.R.T. boiler may prove to be the most practical form of steam generator for these plants.

Early in 1939, we were faced with the necessity of replacing two 150 hp. vertical water tube boilers at the Waterbury Gas Plant. These boilers had reached the end of their normal life, without extensive rebuilding, and their capacity was below plant requirements with increased loads and compressor operation.

Before deciding upon the type of boilers to install, studies were made of steam loads present and future, space available, fuel supply and handling equipment; as well as the ultimate cost. We had just finished the installation of two modern 650 lb. pressure steam boilers in one of our large electric power stations and had been rebuilding other 275 lb. boilers with water walls and other modern features. We were thus conscious that the economies in steam production had been making rapid strides in recent years.

It was, of course, out of the question to install high pressure boilers at the gas plant as all equipment was designed for 125 lb. pressure non-superheat steam. Our first plans called for the erection of two new 250 hp H.R.T. boilers as the most economical and efficient for the required service. By making this a battery installation and extending the boiler room a few feet, it was possible to get this type of boiler in the space available.

The New Package Boilers

While plans were being made for the H.R.T. boilers, it came to our attention that a new type of so-called package boiler had appeared on the market. These boilers were built in, compact, high duty units and had many of the features of the large high pressure electric station boilers. We were at once intrigued with the possibility of these new boilers and visited several installations in surrounding states. In every place visited, the operators were very enthusiastic about the high efficiency and tremendous steam capacities for a given space. Altogether the new boiler seemed to be just what we required for the rapidly growing steam requirements in the Waterbury Plant. Plans were revised and the decision made to install two package boilers instead of the horizontal-return tubular boilers previously contemplated.

Tube and Drum Arrangement

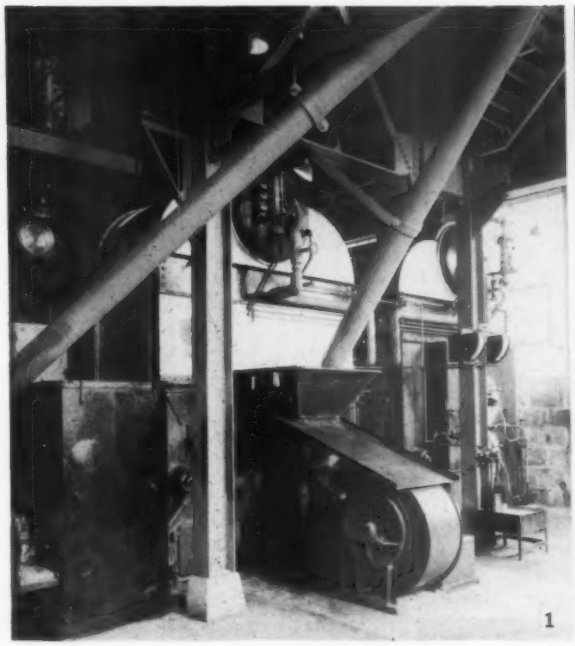
Probably most of you are familiar with the package type boiler, but I will briefly outline the characteristics before proceeding with the details of the Waterbury installation. There are now several makes of these boilers on the market, all of the same general design. They are water tube boilers with a self-contained furnace having water walls on two sides and a roof formed by drums or headers and tubes to the water walls. The only active refractory in the furnace is the bridge wall and the front wall around the firedoors or oil burners. The tubes forming the water walls are backed up by special fire brick shapes and the whole boiler is covered with an insulating blanket held in place with a steel jacket.

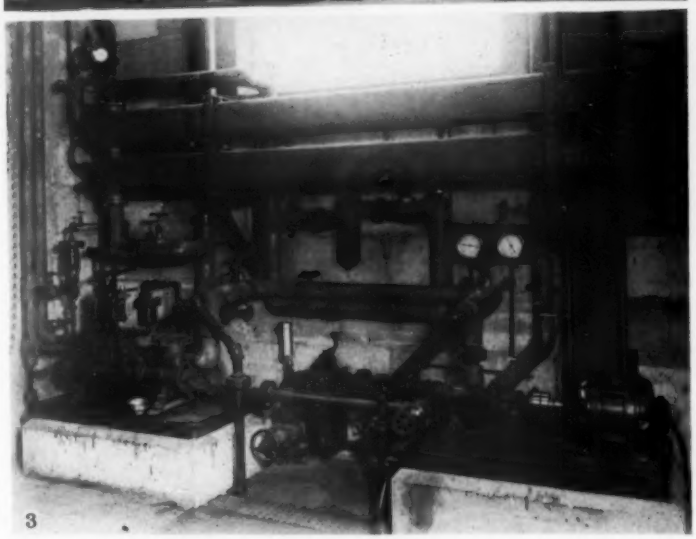
Clinkers cannot adhere to the sides of the walls of these boilers and furnace repairs are reduced to a minimum. More capacity can be installed in a given space than with any other type of boiler, and they may be operated at high overload without danger of foaming or of loss in water level. Furnace air leakage and resulting loss of efficiency are almost entirely eliminated by the use of a tight steel jacket over the entire boiler. The draft loss through this type of boiler is very small which is a great advantage in plants having low stacks.

The Waterbury Installation

The two boilers installed at Waterbury were made by the E. Keeler Company. Each boiler is of 250 hp or 8,500 lbs. of steam per hour nominal rating with an overload rating of 17,000 lbs. per hour or approximately 500 hp. The heating surface of these boilers is 2,500 square feet of which the water walls comprise 319 sq. ft. To make up this heating surface, there are 3,777 lineal feet of 2½" Electrunite tubes of #11 and #12 gauge. The

*Presented at a meeting of The New England Gas Association Operating Division, Boston, Mass., January 15, 1941.





1:—Boiler Room Extension—South Gas Plant, Waterbury. View Showing 2-Keeler 250 H.P.-C.P. Boilers. Mar. 1940.

2:—Boiler Room Extension—Showing the Cast Iron Fuel Storage Bunker. March 1940.

3:—Boiler Room Extension—Shows the Oil Heaters, Pumps and Strainers for Bunker "C" oil.—Jan. 9, 1941.

furnace volume is 707 cu. ft. The space occupied by each boiler is approximately 9′ x 24′ x 13′ in height. Even with this small space requirement, it was possible to have only 18″ aisles outside of the boilers and a 3′ space between them. With practically any other type of boiler this space would be insufficient to allow for erection and later maintenance. With these boilers, however, we can get at every part for clean out and maintenance. Soot blowers are built in from the rear of the boilers and so designed that every part of the main tube bank is reached. Clean out doors at the rear of the boilers and on the center aisle allow for removal of soot and fly ash. It is possible to change tubes in these boilers as easily as with other bent tube boilers. It may be necessary, however, in some cases to remove sections of the jacket to get out tubes. The baffles are of steel plate fastened to the tubes for cooling and prevention of warping. These baffles are all in a vertical position. The use of steel in place of refractory material for the baffles is another maintenance saving.

The steam drums on these boilers are 38″ diameter × 24′ long. The mud drums are 38″ diameter × 11′ 5½″ long. Both drums are of standard A.S.M.E. welded construction.

The headers are made from special tubes and run the entire length of the boiler. Hand holes are provided where the water wall tubes enter the header, also opposite the circulating tubes from the drums. Key caps are used for all hand hole closures. The details of the tube, furnace and baffle arrangement will be shown later on the screen and explained more fully.

One of the new Waterbury boilers is fired with Bunker "C" oil using two Peabody burners. These burners are installed on the front, one above the other, as will be noted on the slides. The air for the burners is furnished by blowers located in a pit at the rear of the boiler. Ducts run from the blowers through fire brick flues underneath the furnace floor to the front of the boiler where they enter a hot air jacket around the oil burners. This construction serves two purposes:

1. It saves the furnace floor from excessive heat which would otherwise cause slag formation.
2. It furnishes preheated air to the burners.

One blower is electric driven for regular use. The other blower is driven by a small steam turbine for emergency use in case of trouble on the electric circuits. The oil burner control equipment including preheaters, pumps, gauges, regulators and strainers is conveniently located on the wall in front of the boiler. Connections are made so that light gas oil or water gas tar can be used in the burners in case of any interruption to the Bunker "C" supply.

The other new boiler is equipped with a Riley under-feed stoker for soft coal operation. This stoker is electrically driven with two motors; one driving the fan and the other driving the transmission that operates the ram. The control for this stoker is semi-automatic. In other words, the steam pressure regulates the rate of feed, but as there is a fireman always in attendance, the automatic damper control was omitted. The air pressure from the fan is also hand controlled.

Mounted on a convenient switchboard in front of the boilers are relays and controls for all of the electric equipment in the boiler room.

Both boilers are supplied with Copes feed water regulators. Bailey draft and pressure gauges are mounted on a column in front of the boilers.

Because of the length of the C.P. boilers and the narrow space available in front of the old boilers, it was found desirable to extend the boiler room approximately 14 feet. This extension was directly under a belt conveyor which carries coke or coal from the track hoppers to the bunkers in the water gas generator house. Thus an easy way to get fuel to the boiler room without the erection of a separate conveyor was provided. A 100 ton cast iron bunker was erected on top of the boiler room extension. To fill this bunker, a plow was installed on the conveyor belt and chutes run to the inside of the hopper. Underneath the bunker a Richardson scale was located which automatically weighs and records all fuel going to the coal fired boilers. From the scale, large tubes run to each of the coal-fired boilers and it is not necessary to move any fuel by hand.

Additional oil storage was not required for the boiler plant. Two heavy oil tanks were already in use for gas making purposes. A concrete trench was run across the yard to these tanks and steam and oil pipes placed inside. All pipes carrying oil, part of the steam lines and electrical conduits were placed in concrete trenches in the floor of the boiler room.

Ashes are removed from the front of the stoker boiler by hand and carted away in wheelbarrows. The plant is not yet large enough to pay for ash sluicing or other handling apparatus.

Operating Characteristics

Many tests have been made on package boilers which show an overall efficiency of 80% or better. In Waterbury, operating results over the past year have shown exceptional savings but other changes were made in the plant besides new boilers which would effect results. We have recently, however, made some rough tests on the stoker fired boilers which give an indication of the operating efficiency under regular plant operation. The results of these tests are as follows:

Average Load during 5 hour test .....225 hp.
Average stack temperature 415° F.
Average CO_2 .....12%
Average Evaporation per lb. coal 11.00 lbs. water
Average Efficiency 74%
Fuel Used—Mixture of Southern bituminous coals

In making the above tests no attempt was made to change normal operating conditions. With higher loads and better regulation of CO_2 it should be possible to reach approximately 80% efficiency.

These boilers have now been in use over a year and the operation has been highly satisfactory. Outside of a few minor adjustments and repairs, very little trouble has been experienced with this installation. Like all high efficiency and rapid steaming boilers, however, it is necessary to watch feed water treatment rather closely. The feed water at this plant is under the same chemical control as our large electric generating plants. A de-aerating feed water heater is used, also a chemical proportioning pump.

From the experience at Waterbury it would appear that any gas company contemplating an extension or replacement of its boiler plant would do well to investigate the merits of these new steam generators.

PURIFICATION COSTS WILL BE LOWER IN 1941...

where a Lavino Activated Oxide is used!

GREATER CAPACITY... GREATER ACTIVITY... LESS OXIDE REMOVES MORE H_2S!

One of these oxides will reduce your purification costs in '41; choose the one that fits your methods:

LAVINO ACTIVATED OXIDE. Supplied in unmixed form... ready for mixing with your own carrier ...LAVINO "ACTIVATED" OXIDE is readily adaptable to the needs of your plant, whatever its size or requirements.

Not merely a "satisfactory" purifying medium by virtue of incidental properties, it is a material made specifically for maximum H_2S removal. As such, its practical capacity and activity are controlled factors.

LAVINO "ACTIVATED" OXIDES

And, it offers maximum activity for trace removal and maximum shock resistance. Contains 70% Fe_2O_3 as received; approximately 10% moisture.

LAVINO ACTIVATED SPONGE is furnished ready mixed, carefully coated on large, tough, specially selected hardwood shavings.

Both are made in the U. S. and are disinfected by a special Lavino process to minimize the formation of mold or other fungous growth.

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E. J. LAVINO and COMPANY · 1528 WALNUT ST., PHILA., PA.

Gas Company Cooking Schools of Southern California Employ Two Different Consumer Approaches

By

Robert A. Latimer

COOKING SCHOOLS come, and cooking schools go, but it remained for the Southern California Gas Company to develop two specialized types of school to achieve very definite purposes. In the first instance the aim was that of reaching into the wealthy homes through a generally overlooked channel. The second objective was that of building future gas customers.

While many of the Company's offices in suburban Los Angeles communities participated in the latter, only the Pasadena office conducted a "School for Maids." This wealthy community has an organization of Negro domestics, known as the Household Employees, and this group was contacted for enrollment in the school; a number of these brought friends.

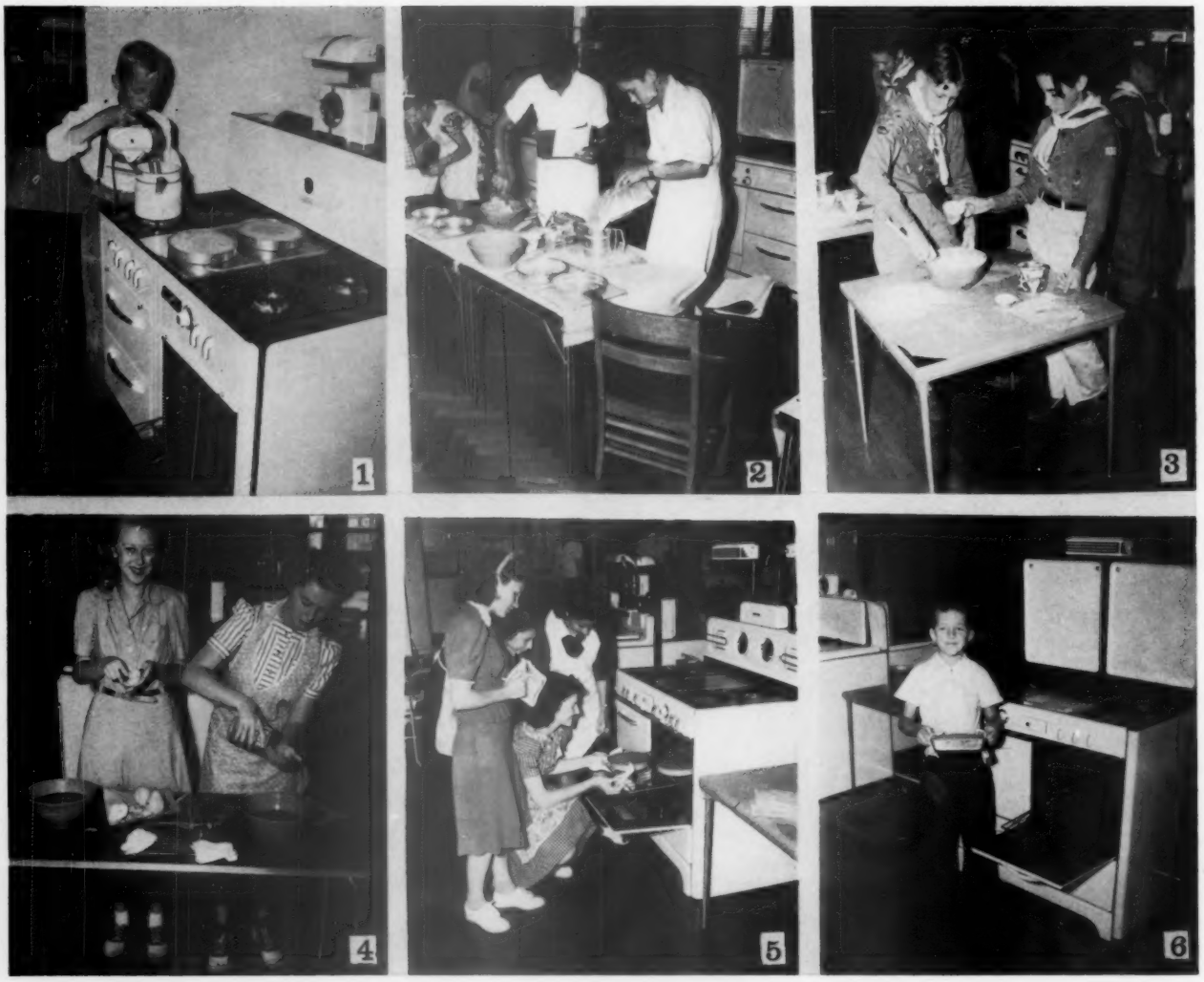
Held once a month, on their days off, there were three hour-and-a-half classes for the Negro domestics, and three special classes for white household cooks. A census of the sizes of homes from which the former came showed a range of nine to eighteen rooms. Average attendance at the sessions for the Negro women was twenty. While a larger group had been anticipated, it was later felt that the comparatively small group had an advantage in being more personal and offering freer discussion—and interest was indeed indicated in the intelligent questions which were asked. As a means of compiling a list from which to start out on another school of this sort during the coming spring, the first class also proved of value.

Mrs. Meyer conducting cooking school. Overhead is a tilted mirror which gives the audience a bird's-eye view of everything at the display.

Mrs. Grace Meyer, Southern California Gas Company's home economist in the Pasadena office, and Mrs. Beth Porter, of the same office, conducted the school, which was presented strictly on a demonstration basis. As indication of the sort of gas equipment which should be in the homes from which the maids had come, a large range was used in the educational program; the unit had two ovens, two broilers and eight surface burners.

Low temperature roasting was one of the main features of the course, and broiling was stressed because it was felt that on the whole this group knew little about correct methods. Complete oven meals figured in the program, and preparation of a quick breakfast was demonstrated.

Pamphlets on file, containing favorite cake, pie and cookie recipes were given attendants, together with the Gas Company's temperature charts. Nothing else was distributed, however; there were neither door nor attendance prizes, nor any other



(1) This young man shows serious concentration operating a mixer. (2) Boys in the Pasadena district learn the cooking art by actually doing it. (3) At Inglewood boy scouts participate and get merit badges and other test credits. (4) College "debs" at Beverly Hills participate. (5) And this group in Hollywood display their cooking ability. (6) When the winners were named none was prouder than this 8-year-old boy from Huntington Park, the youngest in the group to beat the girls at their own game.

entertainment features, and the fact that most of the original enrollees came back a second and a third time not only shows as a credit to the personalities and methods of the two young women who conducted the course, but indicates the merit in approaching this particular field. As a means of entree into these larger homes—virtually the only one available—the class again proved its worth.

Differently planned and executed, the "School for Debs" held during the summer was another successful venture. Here was a program of training tomorrow's gas-users, and at the same time there was a small but logical underlying thought that today's children are educating their parents in a good many ways; that they might pass on to their mothers some of the advantages of cooking with gas was a very reasonable hope which, apparently, was fulfilled in more than one instance.

In Pasadena Mrs. Meyer and Mrs. Porter again had charge of lively groups, and meanwhile the Southern California Gas Company offices in Hollywood, Huntington Park, Alhambra, Inglewood and Beverly Hills were following identical undertakings, appealing to youngsters of junior high school, high school and junior college age.

Because of prohibitions against advertising through the local school systems, there was a problem in reaching potential enrollees. The answer proved to be an approach through the Boy Scouts, the Girl Scouts, the Hi- and Tri-Y and Y.W.C.A., sororities, church groups, and similar organizations. As it turned out, these schools were by no means confined to girls. One district had a demand for a class for young married women; in Beverly Hills there was a class for college girls; eight boys enrolled in a Pasadena class, and another district had a full Boy Scout troop in attendance for the full session, not only learning how to cook but getting part credit for certain Scout tests. To cap it off an eight-year-old boy, the youngest to enroll, was winner in the final cake contest in one district, having competed on equal terms with older children, and with those of the sex which, in theory at least, is most at home in the kitchen. One of the most striking things learned during the conduct of the classes, however, was that the majority of those participating had never handled so much as a rolling pin.

In contrast to the maid's school, the children learned cooking by doing it. The auditoriums of the district offices were filled with ranges, and two students were assigned to each. To solve the problem of space limitations, most offices conducted

It lands on a roof ...takes off on a "postage stamp"!

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The man-made bird comes to roost atop a metropolitan postoffice... amazing even the pigeons. Uncanny *control* that enables the latest autogiro to rise or descend *vertically* makes possible efficient ferrying of mail between airport and crowded city.

Efficient control of top-burner cooking reaches a new high, too, with the Harper Burner System. Its wider range of accurate heat *control* is important to the gas industry—because it *convinces* prospective and present customers that *gas* continues to be the best fuel for cooking.

Copr. 1940, Harper-Wyman Co.

CONTROL *is the secret here, too*

● The Harper Burner System is a patented invention whereby each of the burners on the range is actually 2 burners in 1 . . . a burner within a burner . . . both operated and controlled by a single handle.

This arrangement affords a high-speed STARTING BURNER to *start* foods boiling and for fast frying . . . plus a small, central, economical COOKING BURNER for *maintaining* the cooking. The COOKING BURNER can be used entirely independently of the STARTING BURNER. No other top burner possesses this vital advantage — which insures easy, accurate control: just the right heat for every type of top-burner cooking . . . every time.

HARPER-WYMAN COMPANY
8562 Vincennes Avenue, Chicago, Ill.

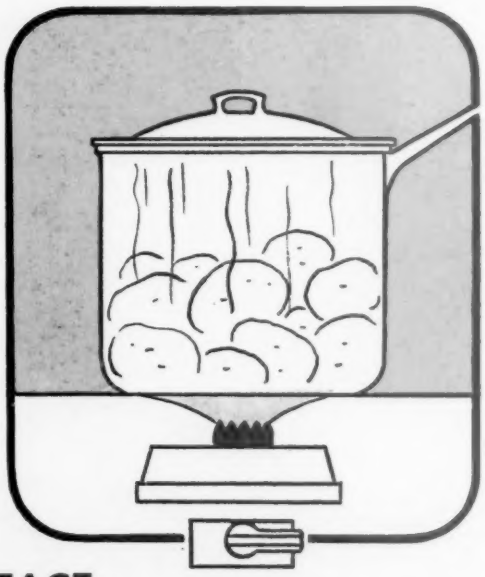
HARPER BURNER SYSTEM

HARPER BURNER SYSTEM

Demonstrates GAS at its best

SEE OTHER SIDE OF THIS PAGE

For *"waterless" cooking...*



The Harper Burner System *"does it better"*

FACT:

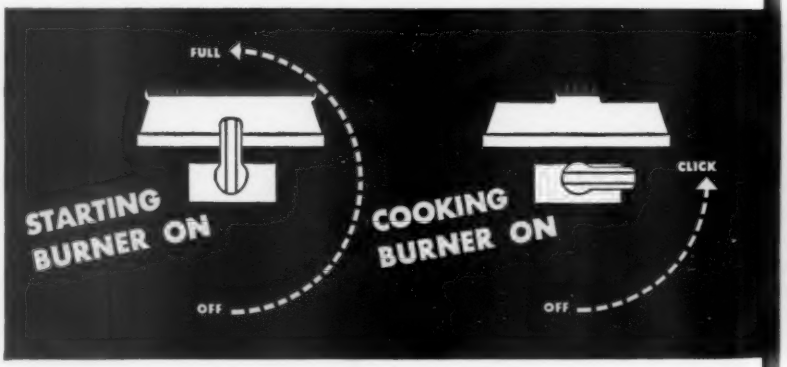
The small, economical Harper COOKING BURNER has a definite advantage in "waterless" cookery, whereby the steam from a small amount of boiling water cooks the food. Any vessel can be used, so long as it has a tight-fitting cover.

REASON:

Very little water is used in the process. This means that the cooking flame should be adjustable to *accurate low heat* levels. That is the reason for the tremendous superiority of the Harper Burner System—its patented principle of construction gives a wider range of heat *control*.

PROOF:

Examine any so-called "simmer", "click" or "Hi-Lo valve" top burner, and you will see that it is simply a *single* burner that can only be regulated by turning down the *complete* burner. Then look at a Harper burner—2-burners-in-1—each operating independently of the other, yet both controlled by the same handle. It is obvious why the small Harper COOKING BURNER, with its *fewer flame ports*, can be adjusted so much lower than ordinary burners.



The Harper Burner System provides a burner within a burner. The diagram above shows how the COOKING BURNER operates entirely independently of the STARTING BURNER. Yet both are controlled by the same handle.

We shall be glad to send you, without cost, two booklets that tell the complete Harper Burner System story . . . "Modern Methods of Top Burner Cooking" and "The Greatest Cooking Discovery in 40 years". They should be valuable to anyone interested in the promotion of gas cooking and gas appliances. *Harper-Wyman Company, 8562 Vincennes Avenue, Chicago.*

SEE OTHER SIDE OF THIS PAGE

HARPER BURNER SYSTEM

HARPER BURNER SYSTEM

classes—each running from 9:30 a.m. until noon—throughout the week, with from 14 to 21 students in each class. Applications, required for admittance, called for name, address, school, day of preferred attendance, and a parent's signature "so we'll know it has their approval."

In the four sessions running between July 8 and August 2, the consumer-reaching program really made the students gas-conscious. All materials used in the student undertakings were supplied by the Gas Company on a schedule which called for them to: bake a cake, make biscuits, roast a leg of lamb, make a pie, oven-can fruit, make ice cream, and prepare an oven meal. After the adjournment of each day's class the students were permitted to take home the things they had prepared, as a means of demonstrating their prowess.

Manuals were made up by the department for each student's use, and as a guide to further cooking efforts.

Following completion of the series of classes a day was set aside in each district for a tea given for parents, where certificates of "graduation" were awarded all those who attended three of the four periods. Too, students were encouraged to bake a cake at home and bring it in the morning to their district's auditorium where all the contributions were judged by a representative from a newspaper, a bakery, and someone from Campfire Girls' headquarters. A complete baking outfit was the prize awarded in each district during the afternoon tea.

Because students were being publicized at work, with an attendant community and human interest appeal, newspapers gave 100 per cent cooperation in furthering the Gas Company's undertaking, and comments were unanimously favorable. Partly as a result of their support, enrollments were refused in every district. A good many domestic science teachers requested permission to visit and see demonstrated the latest methods of cooking so that they, in turn, might use them for their advanced classes. That alone, if nothing else had done so, marked the venture as a complete success.

Above: A group of girl scouts from Alhambra who turned out in force. Below: The boy scouts who were there en masse and enjoyed sampling the results of their work.

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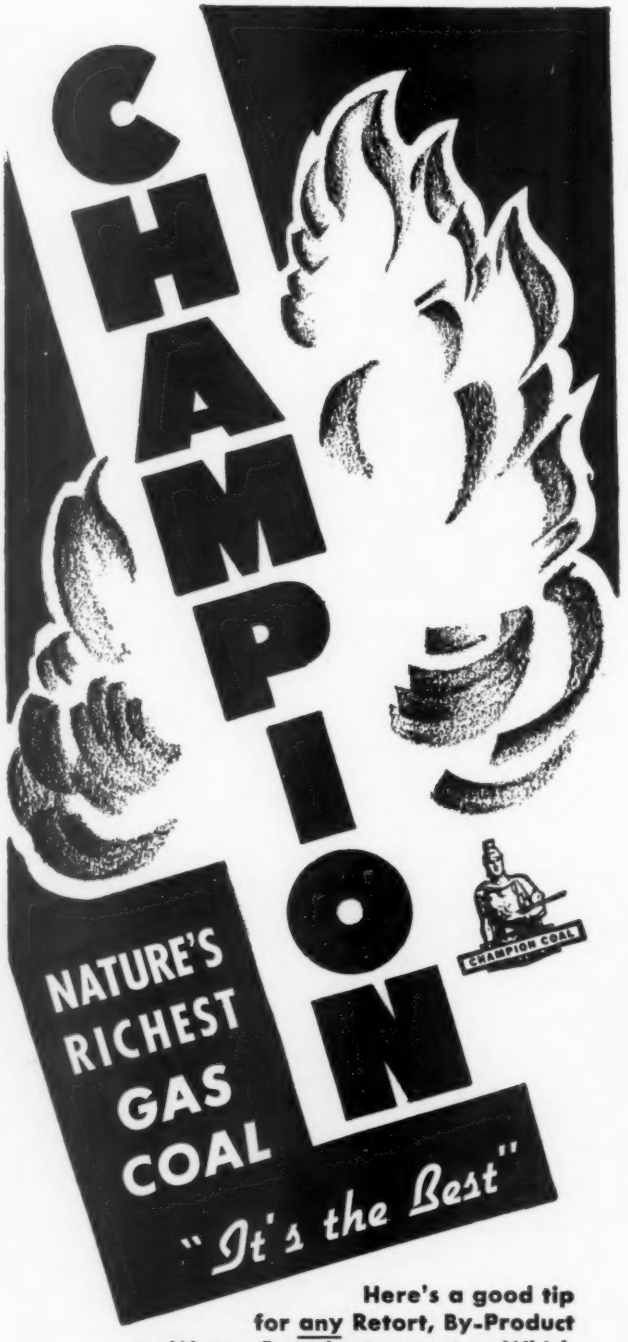

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PITTSBURGH COAL CO. of Wisconsin, Duluth, Superior, Minneapolis, St. Paul
MILWAUKEE-WESTERN FUEL COMPANY, Milwaukee, Wisconsin

The Use of Tar in a Water Gas Generator*

By

L. E. Dequine

Long Branch, N.J.

For several years we had been selling our tar to paving contractors at a fairly good price, but we were required to store the tar during the season when there was no demand for it. As our tar was particularly heavy and the only place to store it in quantity was the relief holder, we had to keep the tar hot in order not to interfere with the operation of the holder. Over a period of time this continuous heating had a tendency to increase the viscosity of the tar beyond the point at which the road makers could advantageously use it. Several times we had trouble in disposing of our stock. Two years ago in order to eliminate this winter accumulation we put in burners to utilize tar in the steam boilers. We found that we could replace other fuels to a value of 3c per gallon for about 70% of our make. The balance could be used to generate electricity, but the value was only 1¼c per gallon.

A comparison of the B.T.U. value of the tar with that of the coke which we were using would indicate a value of 5¼c per gallon on the assumption that tar could be used to replace generator fuel with the same efficiency. Even with some decrease in efficiency tar could still be disposed of more economically by using it in the generator than in any other way.

We were fortunate to obtain a contract for the sale of our tar at a somewhat low but very fair figure for 1940; and because of the large accumulation during the winter, we wanted to dispose of all the tar we possibly could before the end of the paving season. Had we used dry tar in the generator, we would necessarily have had to cut shipments, as the contractor was willing to take all that our dehydration plant would handle. We wanted to burn tar in the generator, and we wanted to be sure that what was thus used was in addition to what we could dispose of otherwise. We, therefore, took the emulsion as it was sent to the stills with about 30 to 50% water, and almost all of our experimentation was done with this type of material. We ran for one or two days on dehydrated tar; and while we had no opportunity to judge of the efficiency of the operation, it was physically a success and the handling of the tar was apparently much more simple than the use of the emulsion.

In the figures which I have prepared, the tar is figured as dehydrated, but it was actually used with a considerable water content. I believe that the efficiency can be improved by dehydrating in the stills instead of in the generator.

It would seem to me that burning tar in the generator should be a simple thing for anyone who has reformed oil as this is the manner in which we have handled it. Not having had much experience with reforming oil, a number of problems were encountered which would have not been new to one who was used to reforming. We made only minor changes in our operation, and to some extent those changes have been retained for regular operation without tar and without reforming. I have included some data on the cycle before and during tar operation. The principal change made was to decrease the blow run by two points on the automatic control, and add the same amount to the air purge. We also cut the back steam rate in order to compensate for the heat removed from the top of the fire by the tar. We had previously had occasional trouble with smoke at the beginning and end of the blow; and this was worse while burning tar than previously, so in connection with burning of tar, we made some changes which should have been made anyway. We closed the carburetter blast valve two points ahead of the stack valve and opened it two points before the stack opens. In both instances there was only an insignificant puff of smoke.

We tried to open the generator blast and the carburetter blast at the same time with a resulting pop which lifted the stack valve and caused it to leak, so we advanced the generator blast to four points ahead of the stack. Our set is so arranged that the steam and generator blast are operated by the same cylinder on the automatic. As we had only six cylinders on our automatic, we had to add the blower intake valve to the same cylinder, in order to provide room for a tar control. The blower is electric driven and runs continuously, and the closing of an Iris Valve on the intake is the only control we have over the blower running idle. By means of a throttle valve and check valve we were able to delay action so that the Iris Valve opened slightly before the generator blast and closed a fraction of a second after the generator blast closes. Were we to use a blower which stops during the run period, we would have to get an automatic with an additional cylinder. Making this change permitted us to use the blower piston to turn on and off the tar, which was handled exactly as the oil with the same spray, but a different set of oil valves and steam purge equipment.

Our first attempts were with hand control of valves which admitted tar

Burning Tar in the Water Gas Generator

Long Branch, N. J.

Setting	*Old Cycle*	*Cycle on Tar*
Reverse Valves	92/67	91/65
Oil Valves	65/36	64/34
Stack Valve	0/30	0/30
Blower	36/96	
Tar Valve		76/66
Generator Blast	35/98	33/96
Carburetter Blast	29/0	28/98
Back Steam Rate	240	190
Stack Valve Opens	0	0
Carburetter Blast On	0	
Carburetter Blast Closes	29	28
Stack Valve Closes	30	30
Generator Blast Off	35	33
Oil On Up Run	35	34
Oil Off	66	64
Reverse to Back Run	68	65
Tar on Back Run		66
Tar Off		76
Reverse to Up Run	92	91
Generator Blast On	98	96
Carburetter Blast On		98

Division of Cycle	*Old Cycle*	*Cycle on Tar*
%Blast	30	30
Blow Run	5	3
Up Run	32	32
Back Run	25	26
Steam Purge	6	5
Air Purge	2	4

* *Presented at a meeting of The New England Gas Association, Operating Division, Boston, Mass., January 15, 1941.*

to the oil spray during the back run, and included a hand operated steam purge. We endeavored to distribute the tar injection pretty well over the length of the backrun. We corrected the backrun steam in accordance with the formula for reforming oil; that is, we decreased the steam about one-half as much as the weight of the tar injected. We found that this was not enough, and we had to decrease the steam about 100% for the water content, and something over 50% for the weight of the tar. We still had smoke, so we tried injecting the tar as fast as the oil spray would take it. We found that this required about ten points, or twenty-four seconds, leaving fifteen points of backrun, five points of steam purge and two points of air purge to drive the smoke out of the machine before the stack was opened. We then had no further trouble with smoke. I think we have accomplished two things in speeding up tar injection. We sprayed the tar in at much better efficiency and also gave the machine an opportunity to clear itself before opening the stack.

I have figured the economy obtained in our experiments in two ways. First, I added the cost of the tar to the cost of the other materials used in gas making, using a value of 3c per gallon, which was the figure obtained from the sale of the tar and approximately the value obtained in the boilers. This method shows a cost for materials of 20.895c. During the preceding seven months when we had operated without tar our costs were 21.103c. This shows a saving of a little over .2c per M. Second, I took the difference in the cost of the materials less tar in the two operations and divided by the tar used. This computation resulted in a value of 4.06c per gallon.

The results obtained so far are probably not the ultimate economy that can be obtained in burnnig tar in the generator. As in every other scheme for operating a water gas set, it is necessary to get a proper balance between the heat available and the heat required in the different parts of the set. The injection of tar into the top of the generator disturbs the existing balance. We tried to compensate by cutting down on the backrun steam. I am not sure that this is the way it should have been done. Maybe a change in the ratio of oil in the generator and carburetter might have served better. Further experimentation should be made before any final conclusions are drawn. What we have to report now is only the beginning. What has been accomplished has been done with make-shift equipment. We used the same spray for oil and tar. We found the spray which was intended for the oil would clog up rapidly with the tar and required frequent shut downs for cleaning. We purchased a blank spray and drilled it with five holes of equivalent capacity to the twenty holes in the original oil spray. We changed the angle from 30° with the vertical to 25° with the vertical. As you may surmise this was not one operation, but was a result of about a month of experimentation with different numbers and sizes of holes and different jet angles. If we assume that the original oil spray was most economical for oil alone, there must have been a decrease in oil efficiency reflected in the costs for operation with tar. We might be able to use the original oil spray with dehydrated filtered tar. Probably for best operations, it will be necessary to have two sprays, one suited to oil and one suited to tar. On account of the large water content, we could heat our tar only to 200°. In burning it in the boilers, we obtain the best efficiency at 350°. With the make-shift pump which we used in our work, we were unable to obtain as high pressure for the low temperature as we used in the boiler room for the tar at the higher temperature.

We plan to make a further expenditure for equipment to use tar, but I do not yet know what should be specified. From the work so far, I am certain that there will be no difficulty in using in the water gas generator all of the tar that is left over after the boilers have been taken care of. There is, therefore, nothing to worry about if we are unable to dispose of our tar to outside contractors. With the lower values of water content, we handled tar to the equivalent of 10% of the oil used. A volume for volume allowance for the water in the tar would increase this ratio to about 14%. We may be able to use all of the tar in the generator and buy cheaper fuel for steam making.

Our yield of tar is about ¾ gallons per M, and if we can change the value of this entire amount from 3c to 5¼c the prospective savings would be 1.69c per M.

Jersey Central Power & Light Company

Long Branch Results During Year 1940. The First Three Columns Cover Periods Using Emulsion in the Generator and the Last Three Columns Cover the First Seven Months of the Year When No Emulsion Was Used.

	Total	*Units*	*Cost*	*Total*	*Units*	*Cost*
Gas made	124,514			833,450		
Set hours	596.9	208.6		3856.0	216.1	
Hours cleaning	78.1			377.5		
Running hours	518.8	214.0		3478.5	239.6	
Number of runs	7027	17.72		51917	16.05	
Average B.t.u.	530.4			532.3		
Oil	445 077	3.57	13.180c	3,126,597	3.75	13.845c
Bituminous	339,440	2.73	.801	1,888,575	2.27	.666
Coke	1,886,092	15.15	6.477	12,853,390	15.42	6.592
Tar	24,263	.195	.585			
Total			21.043			21.103c
Credit for steam saving in set (3#/MCF)			.090			
Credit for dehydration saving			.058			
Net cost			20.895c			21.103c
Cost of materials without tar	21.103c	per M				
Cost of other materials using tar	20.310	" "				
Gallons of tar used	.195	" "				
Value per gallon	4.06c					

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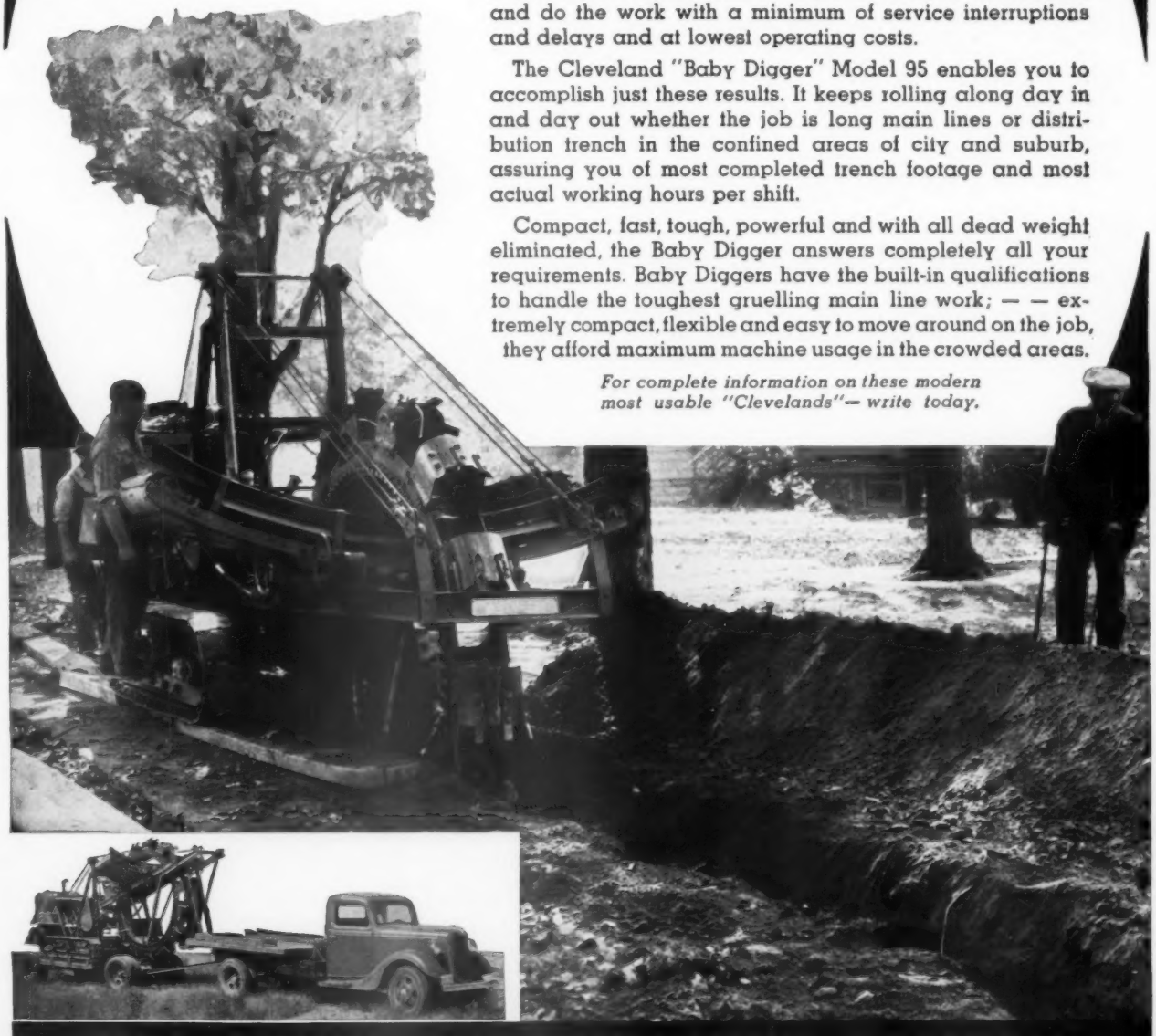

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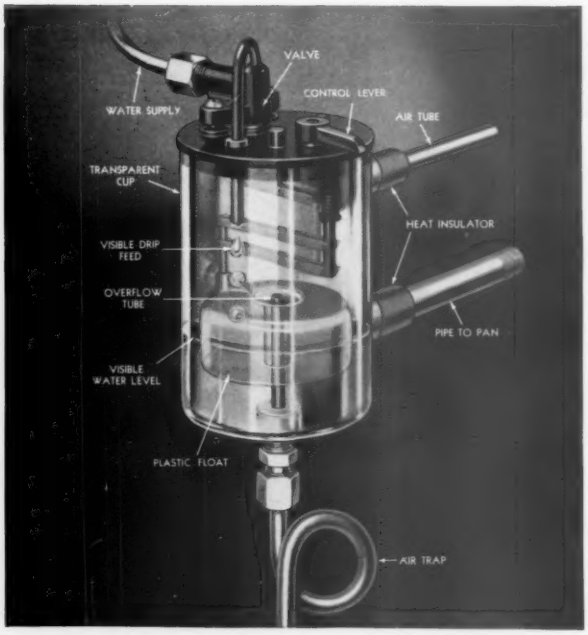

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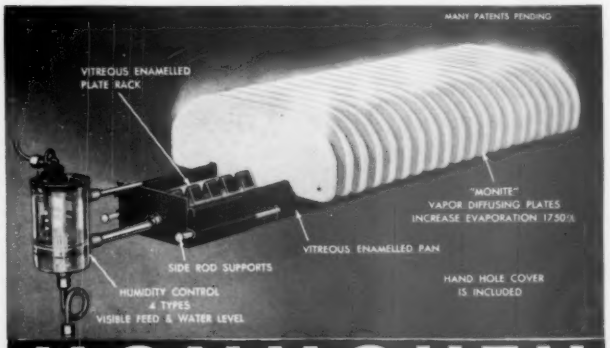
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Portland Heating Code Benefits Heating Dealers and Utility With Its Observance

By
Arthur J. Larson

THE Portland, Oregon voluntary code of standards for major house heating installations has achieved remarkable results in the time it has been in operation. As far as known no other city in the country has worked out such a code that has abolished price-cutting and high pressure selling among the major gas house heating and air conditioning firms.

The simple principle underlying the code is this: "The Customer Must Be Satisfied."

With this in mind the code was drawn up and systematic observance of it allows everyone to benefit, asserts Cecil M. Macgregor, Portland Gas & Coke company heating engineer. Mr. Macgregor started the plan and perfected it. Eighty per cent of the most reliable dealer firms in the city find it the best code of business ethics yet.

Benefits derived from the code are:

The major gas house heating dealer makes more money because he sells a better type of furnace and installation. The selling does not involve price cutting as sales are based on quality and satisfaction.

The house heating dealer has a better break in competitive bidding because he knows his competitors are bidding with the same standards in mind.

The customer is more pleased with his installation, his costs of operation are less, and his difficulties are fewer and the life of his heating plant is longer.

The gas company benefits by fewer service calls; and the architect, builder, or contractor benefits because this is one sure way of insuring his client of the best in heating plants.

What is this code and how does it work? An idea of this may be gained from the following:

Furnace Installation Standards

Section 1—General Provisions:

Nothing in these standards is intended to conflict with existing laws governing the installation of equipment under consideration. Where conflicts are encountered, State, County or Municipal regulations shall prevail.

Only gas furnaces acceptable to the Portland Gas & Coke company shall be eligible for usage under these standards.

All controls and other equipment used in connection with furnaces shall be acceptable to the utility.

All gas piping shall be installed according to standard rules and regulations.

Chimney shall be checked for size and thoroughly cleaned if necessary. Where no cleanout is in flue, one shall be installed.

Vent pipe (smoke pipe from furnace to flue) on all installations shall be installed in such a manner that it can be removed for cleaning and inspection and shall comply with the Portland City code.

All accessories, valves, controls, etc., shall be so installed as to be readily accessible for inspection and adjustment.

Every room in which a furnace is installed shall be provided with an adequate means of supplying outside air to such furnace room.

In Section 2 of the code heat loss calculation provisions cover:

The heat loss of the house and size of pipes, risers, registers and cold air ducts shall be figured by the formula of the heating code of the city of Portland, excepting that in figuring living and dining rooms with two exposures, the cubical contents shall be divided by 600, and if such rooms have three exposures, the cubical contents shall be divided by 500 to determine the basic factor for cubical contents.

All floors not over that portion of the basement heated by furnace and piping, or over any unheated rooms, shall be considered as "cold floors" and figured in heat loss.

All heat loss calculations to be for 70 degree inside temperature when zero outside.

In regards to the Control Equipment, gravity installation and forced air installation the code says:

On gravity installations the following equipment shall be used: pressure regulator, main control gas valve and pilot gas cock, automatic pilot, filter on pilot gas line, automatic gas valve and thermostat, automatic humidifier or automatic pan filler, and draft diverter.

On forced air installations all the above equipment shall be used with the following additional equipment: An adjustable automatic furnace switch which will stop and start the fan motor at predetermined temperature, an automatic air high temperature limit control switch, a manual switch for summer control and an overload throwout switch to protect motor.

On gravity furnace installations the furnaces must be set on a proper foundation and the lower ring sealed to the foundation in a dust and airproof manner. Other conditions being:

Bonnet shall be of pitch type, installation as to warm air and cold air piping shall be governed by the warm air heating code of the city of Portland, and the installer must determine the square inch pipe area required for any pipe by using the city code. The net area of cold air return ducts shall be at least equal to the connected heat pipe area.

Cold air return grills shall be located to drain the house to avoid objectionable drafts, and in living rooms shall be located as near as possible to the points of greatest heat loss.

When it comes to forced air installations in residential buildings the installers must see to it that all forced warm air heating systems are installed in accordance with the "Mechanical Warm Air Furnace Heating Systems in Residences" code as compiled by the National Warm Air Heating and Air Conditioning association, except as stated below:

All forced warm air heating systems are to be installed in accordance with national code, except the City of Portland heating code coefficient factors shall be substituted for table A of the Mechanical code, except as specified in the heat loss calculation provisions stated above.

The installer must install cold air return grills in all rooms excepting kitchens and bathrooms. Design register temperatures shall be 140 degrees Fahrenheit. The air delivery at any register shall be calculated not to exceed 150 cubic feet per minute in living rooms and halls; other rooms 200 cubic feet per minute at 140 degrees F.

The velocity at registers when installed at a point seven feet or more above the floor shall be calculated at not less than 600 feet per minute for residential installations. When the register is installed below this seven foot point, the velocity shall be figured at not over 400 feet per minute in living rooms, dining rooms and halls and 525 feet per minute for all other rooms.

In all cases, an outside cold air duct shall be provided and connected to the system with an individual duct to fan housing. On old houses where no return air is taken from the second floor rooms, the outside air supply shall be at least equal to the CFM required for the second floor rooms. In no case shall the amount of outside air be less than 20 per cent of the total CFM requirements of the heating system and never less than the total CFM's required by those rooms not equipped with cold air returns.

Outside return must have screen, quadrant damper and, when necessary, a louver grill at its outer end.

Cold air returns may be carried between joists and then dropped into a main trunk or fan housing. A suitable quadrant, throat, or accessible flap damper between joists below cold air register shall be provided to regulate volume of cold air through each cold air return register.

Air from unheated basement of furnace shall not be circulated through the heating system.

The design static pressure for the duct system on old houses shall be that for the duct having the greatest resistance per hundred feet of equivalent length.

In the case of new work the following static pressures may be used in determining the fan capacity requirement:

Houses requiring 1200 CFM or less—¼" water column.

Houses requiring 1200 to 1800 CFM—⅓" water column.

Houses over 1800 CFM—½" water column.

For houses having trunk lines 40 feet or more in length, static pressure shall be calculated and duct sizes calculated accordingly.

In selecting a fan from a manufacturer's catalog, a fan size shall be selected that will deliver the required CFM's (cubic feet per minute) at the above static pressures and at a speed not to exceed 475 RPM (revolutions per minute), unless stock fan can be operated to deliver the required amount of air without objectionable noise.

All duct work shall be installed using weights as specified by the American Society of Heating and Ventilating Engineers, and each duct shall be properly fitted with quadrant dampers installed where accessible for regulation and at least 18-inches from take-off on plenum or main trunk line.

Not more than one branch shall be taken off within one pipe diameter of the corner of the plenum chamber. Branches from the main trunk shall be taken off the duct with the branch parallel with air flow in main trunk, and main trunk shall be of size that a splitter damper, if used, shall not restrict the flow of air in main trunk. Scoop baffles shall not be used to divert flow of air into branches.

All turns in duct system, both warm air pipe and return air ducts, shall have a throat radius of 50 per cent of the width or diameter of such pipe or ducts, and the outside radius shall be 150 per cent of the width of the diameter of such ducts.

When the temperature drop in a duct between the furnace and register is 30 degrees F. or more, the duct shall be covered with suitable insulating material. Where the heat loss of the duct system is in excess of 10 per cent of the output capacity of the furnace, the system shall be covered with suitable insulating material.

When a furnace with a casing designed for gravity is used in forced air work, a baffle shall be installed above the furnace radiation having an opening into the plenum chamber of not more than 80 per cent of the cross sectional area of all heat pipes connected to the plenum chamber, and the plenum chamber shall have an area equal or in excess of the total area of all heat ducts connected to the plenum.

Dealers of heating plants after reading over the code and having installations to make sign a form as:

"We agree to install a (Gravity) (Forced Air) type gas-fired heating plant for *Mrs. John Public* at *1234 Public avenue*, in accordance with these specifications. If upon inspection by the Portland Gas & Coke company the installation is found not to conform with the code specifications we will make the necessary changes without cost to the purchaser.

Dealer.....

By ....."

Upon completion of the heating plant the dealer notifies the utility and the gas company sends the purchaser a letter with an enclosed post card. The purchaser always sends in the post card for the inspection of the job which the utility gives free.

This code, self-imposed upon dealers selling heating plants, has worked very successfully in Portland, and with 1200 major gas heating installations so far in 1940 being made, which is a fifteen per cent increase over 1939, dealers who conform to the code are very enthusiastic. They make more money and sub-standard jobs are practically unknown.

Date.....

Portland Gas & Coke Company
Public Service Building
Portland, Oregon

Dear Sirs: We have recently purchased a gas furnace. The installer has now completed the installation. Please make an inspection of this installation and determine whether or not it is made in accordance with your "Gas Furnace Installation Standards" and report your findings to me by letter, with copy to the installer.

Name .....

Address .....

Cooperation for National Defense

By

Lieut. Col. Clark S. Robinson

Ordnance Reserve, U. S. Army

I HAVE been asked to speak at this meeting of the New England Gas Association on the relation between the Gas Industry and the defense program of the United States Army, with particular reference to the situation in New England. The Gas Industry is anxious to know in what way it can cooperate to the best advantage with this program. However, before giving you my ideas on this subject, it will be necessary to explain to you in some detail just how the United States Army is going about its defense program so that you will understand the reasons for some of the ways in which business is being done.

In the first place, at the close of the World War in 1918, the Army and the Navy, realizing that preparation for a future war should be started immediately and having as a background all of the trials and tribulations of that conflict, formed an unofficial committee called the Army and Navy Munitions Board. The object of this Board was to handle the joint requirements for both branches of the service in such a way that there would be a minimum of duplication, overlapping and competition. This Army and Navy Munitions Board, which was made an official organization by executive order of the President a year or so ago, then made a very exhaustive study of future Army and Navy requirements for the country based on past experience and what it expected would be needed in the next war. So far as the Army requirements were concerned, it divided the country up into sections depending on their munition production capabilities. The Army buys or manufactures the materials which it needs separately for its several branches, that is, for the Infantry, the Field Artillery, Coast Artillery, Air Corps, and so forth. However, the three large procurement branches of the Army are, in order of size, the Air Corps, the Ordnance Department, and the Quartermaster Corps. The other branches of the Army buy materials in considerably smaller amounts than these three. Taking as an example the Ordnance Department, the Army and Navy Munitions Board divided the country into sixteen Ordnance Procurement Districts. Two of them were combined with others so that at the present time there are fourteen such districts. Boston is in the Boston Ordnance District which includes Maine, New Hampshire, Vermont, Rhode Island, and the eastern half of Massachusetts. The Hartford Ordnance District includes Connecticut and the western half of Massachusetts. Then there are New York District, Philadelphia District, and so forth. Each of these districts operates and makes its purchases independently of all of the other districts. There is, however, easy and frequent cooperation between them.

The Army and Navy Munitions Board then drew up on the basis of this sort of work what was called a mobilization plan and these mobilization plans have been revised from time to time, the most recent one being the Industrial Mobilization Plan of 1939, copies of which may be obtained from the Superintendent of Documents, Washington, D. C., for ten cents. Copies of these national mobilization plans purchased for ten cents are reputedly submitted to foreign governments by their secret agents in this country as documents of great secrecy and importance.

Following the outline of the most recent mobilization plan, the Boston District Ordnance Office, which at the present time is located on the fifteenth floor of the building at 140 Federal Street, Boston, made a survey of all of the manufacturing plants in this district with a view toward learning which of these would be available in war time for munitions production. This survey took a number of years and was very complete. The similar surveys made in all of the other districts were then submitted to the planning division of the Army and Navy Munitions Board, similar surveys being submitted by other branches of both the Army and the Navy. The Army and Navy Munitions Board, then having compiled the requirements for both Army and Navy, divided up the requirements among these surveyed plants in such a way that the burden of production would be as equitably distributed as possible over the entire country and so there would be no overlapping of interests. When this was done, the Boston Ordnance Office was then advised what plants in this district would be expected to go into the manufacture of munitions in war time and it then became the duty of the Boston office to get into contact with these plants and see if they would be willing to undertake the manufacture of certain specific materials in time of war. If they expressed such a willingness, then there was drawn up for each manufacturer what was called a Wartime Production Schedule which the Ordnance Department and the manufacturer both signed. This Signed Production Schedule, as it is called, merely is a statement of the willingness of the manufacturer to undertake that particular job when called upon to do so. It is not a legal contract in any sense of the word.

A great deal of the material needed by the Army is material which resembles ordinary peace time manufacture for civilian purposes. On the other hand, the weapons and ammunition with which an army must be supplied are quite different from the usual line of manufacture and most plants do not know how to make this sort of equipment and supplies. Some of it is fairly simple to make but most of it is very difficult. On that account, two years ago Congress authorized the placing of what are called educational orders which are contracts made between the Army and a particular manufacturer by negotiation rather than by competitive bidding, whereby the manufacturer agrees to set up machinery for manufacturing the product desired on a semi-plant scale and then to manufacture enough of it to make sure that he knows how to operate the machinery. When that is done his production is over and he holds his

Presented before the New England Gas Assn., Industrial Division, Boston, Mass., January 17, 1941.

machinery in stand-by condition for future use. Such educational orders have been placed solely with those concerns which have signed production schedules for wartime manufacture.

At approximately the same time as educational orders were being placed in this country, it became necessary to place large quantities of production orders to build up the supply of arms, ammunition and other materials required for the Army so that in case of war an army of two million men would have everything it needed. This required the appropriation of the exceedingly large sums of money which have been made by Congress during the past two years. At present writing, Congress has appropriated approximately sixteen billion dollars for defense purposes. Of this amount of money, contracts amounting to approximately three billion dollars have been placed for Army requirements, five billion for Navy requirements, four billion has been set aside for operating expenses for the Army and Navy, and up to September 28, 1940, there still remained about four billion dollars, contracts for which had not been placed. It is understood, however, that at the present time the expenditure of most of this money has been provided for.

The production of munitions falls into two groups. The first group is the production by commercial organizations in their own plants. The second group is the production of materials in government owned plants. For example, the Ordnance Department of the Army owns six manufacturing arsenals, Watertown Arsenal, for example, being the one nearest Boston. In these government arsenals, arms and ammunition and other army requirements are manufactured by the Government for its own use. The Government is also building arsenals in other parts of the country which will be operated by commercial concerns which are being hired for the work. These arsenals are the property of the Government and the commercial organizations running them will act solely as operating groups. Present plans call for the construction of 139 of such government plants and arsenals. None of these 139 plants will be built on the Atlantic seaboard, all being built west of the Alleghenies, presumably out of range of bombers operating from the ocean. The 139 plants and arsenals comprise a wide assortment of operations. For example, they include four smokeless powder plants, four plants for the manufacture of T.N.T., two plants for the manufacture of tetryl (a high explosive), two plants for the manufacture of picric acid and Explosive D (also high explosives), two plants for the purification of cotton which is used in the manufacture of smokeless powder, two plants for the manufacture of ammonium nitrate which is used in high explosives, one ammonia plant, eighteen plants for loading shells and bombs, five bag loading plants for ammunition, two fuse loading plants, two small arms ammunition plants, six plants for the manufacture of machine guns and airplane cannon, one shell machining plant, two armor plate plants, four plants for the manufacture of metal components for ammunition, three proving grounds, all of these in addition to the six manufacturing arsenals earlier mentioned and ten existing ordnance storage depots. This long list of required plants is for the Ordnance Department only and they are in addition to all of the privately owned and operated plants with which the Government has made contracts for manufacturing this sort of material.

The New England Gas Association will therefore not come into direct contact with any of these new Government arsenals as they are all in other parts of the country. The New England Gas Industry will, however, be in close contact with a large number of New England firms who have already signed contracts with the Army to manufacture munitions. In order for the Association to know which of the New England firms are at present engaged in Government work, I have prepared a list of those companies which are working at the present time on contracts with the Ordnance Department. It should be realized, of course, that a large number of other concerns are doing business with the Navy and other branches of the Army, notably the Air Corps and the Quartermaster Corps.

Manufacturers are making munitions for the Ordnance Department in New England and practically all of the material being made consists of machine tool products, a large part of which requires heat treatment of some sort or another in its manufacture and it seems obvious that the largest part of the demands which will be made on the New England Gas Industry will be for the firing of furnaces for heat treatment purposes. It is suggested that the individual gas companies contact companies in their respective cities who have Government contracts in order to find out what their present and future requirements for gas heating are going to be.

In regard to the other requirements of the Army so far as the Gas Industry is concerned, the most spectacular one is for the production of toluene for making T.N.T. You might be interested in an item which I found in a periodical recently giving toluene exports from the United States during the first nine months of 1940. During this period approximately twelve million pounds went to Italy, ten million to the United Kingdom, five million to France, four million to Canada, four million to Sweden, three million to Japan, and smaller amounts to other countries totaling forty-three million pounds. It is reasonable to suppose that the Swedish importation went to Germany and that a large part of the Italian shipments did also. The Army requirements for toluene for our own use in case of war appear to be taken care of by potential production from existing gas works and coke oven plants already operating in this country, the potential toluene production from such sources being in excess of two hundred million pounds per year. Of course this toluene so produced is in the crude state and must be very highly refined in order to make it suitable for the production of T.N.T. There will be some competition, however, as the government has made contracts with some petroleum refining companies for the manufacture of toluene from petroleum raw materials. The toluene situation, however, has been considered critical by the Army in that it is expected that the requirements of the Army for toluene will cause restriction of its use for its ordinary commercial peace time purposes. Benzol from gas works and coke oven plants is also a critical material for Army use as it is a raw material for the manufacture of certain high explosives, notably picric acid and Explosive D, which is a shorthand name for ammonium picrate, the high explosive used in armor piercing projectiles. The demand for ammonium sulphate for fertilizers will undoubtedly increase as more of the synthetic ammonia is shunted into explosives.

The foregoing requirements of the Army will give you a good idea of the problems with which this country will be faced, particularly if the seventeen billion dollar new appropriations are made by Congress this coming year. In addition to all of this work purely for the United States national defense, it must be remembered that the British Purchas-

ing Commission is also buying extremely large amounts of very similar materials in various parts of the country and that a large number of plants have been built with British money and are now operating producing munitions for the British government. There is every indication to believe that the British requirements will increase materially in the near future. The materials being produced by the British are of similar character to those produced for the United States Army but, however, different enough so that one cannot be substituted directly for the other. For example, the small arms ammunition for the United States Army is .30 calibre, while British small arms takes .303 calibre, the ammunition being enough different in its dimensions and other characteristics so that a plant manufacturing ammunition for the British government would have to make numerous changes in order to manufacture United States Army ammunition. It is felt that the Gas Industry can be most helpful by being ready to cooperate when called upon to do so with little or no warning and with a minimum of delay in supplying gas for heating and in recovering light oil for its benzol and toluol content. It should be noted that a large number of the concerns which are now working on United States Army contracts have undertaken them not at their own volition but at the direct request of the Army and the number is likely to increase in the immediate future. The legal right of the President to commandeer plants for defense purposes, which he has possessed since 1916 and which he can use in wartime or when war is imminent, will probably not be used except as a last resort. The main object of all of this defense preparation has been stated so many times that it is unnecessary to go into it again. Most of the people who are now engaged on defense contracts have accepted the work with a sort of philosophical resignation to a more or less unpleasant duty which has to be done and which will continue until Hitler is licked.

New Officers & Directors of The New England Gas Association Operating Division

Chairman—Charles P. Warner, Manchester Gas Co., Manchester, N. H.

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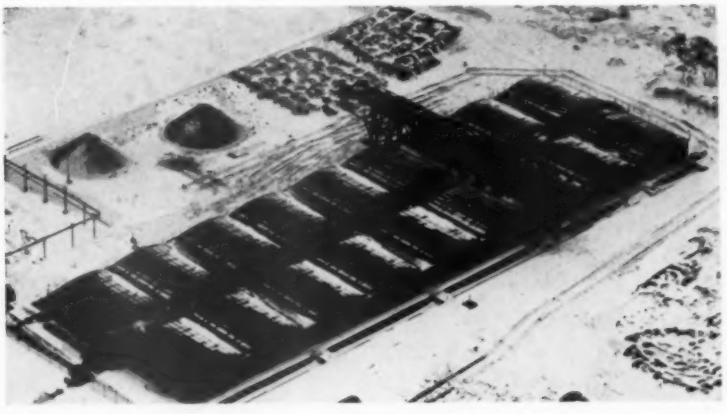

Dependable Purification *when the make begins to climb*

GPM IRON HYDROXIDE

GAS PURIFYING MATERIALS COMPANY

LONG ISLAND CITY, N. Y.

Sell 'Em America

By
Oscar Vogl

Merchandising Counsellor
Founder Patriotic Poster Service

FOREIGN SALES like domestic trade thrive on good will and friendship, as Elbert Hubbard used to say: "Your enemies will not buy from you therefore if you want to increase sales make more friends."

What the world is fighting for today is not so called Lebensraum, democracy or dictatorships but world markets.

While we are rapidly becoming the world's safety deposit center for gold and other commodities, slave labor and barter deals are taking trade from our plants.

These foreign markets are further demoralized for us by clever propaganda and shrewd fifth column activities. Malicious gossip can destroy more sales than hundreds of go-getters may build up.

While such competition may be dangerous in the home field it is disastrous in the world market.

To maintain the American standard of living we must protect our foreign trading posts. If we depend on a British navy or on a Hitler-Mussolini promise we are not building on substantial American ground.

One thing history and business experience should have taught us and that is—*depend on yourself.*

Instead of letting foreign propagandists penetrate our country with a variety of Ism schemes let us sell our people on our way.

It is highly amusing if it were not so serious and alarming to attend meetings of Americans and listen to their arguments pro-Allies or pro-totalitarians or pro-communists with very little emphasis on the pro-American.

When all is said and done no matter where our grandfather or great-great-great grandmother was born—they all came to the United States to better their conditions and to build a nation of free men.

Now, why are we here supporting nests of fifth columnists and groups of anti-American Comiterns whose Commanders are in Moscow, Berlin, Rome and Madrid?

There is more to this than printer's ink, postage and sales arguments.

Before we start shouting and coining slogans we might better organize ourselves first.

There is plenty of work to be done here and now. Let us commence by destroying fifth column activities in our midsts before we give lectures in Spanish, French or Portuguese.

In our constant contacts with one another, supposing we commence with a very simple but effective signing of our mail with the patriotic salutation such as—*"Yours for America."*

Nearly all the mail out of Germany is now signed: *"Heil Hitler."* Lots of business letters from Italy end up with: *"Viva il Duce."* Or from Spain: *"Viva il Franco!"*

We sit here and laugh about it, but it is no laughing matter. Every country whose independence has been lost in this war has indifference, traitors and propaganda to blame for it.

Military Preparedness is quite all right. Let us support it with a bit of our own propaganda for God's Country; while we remain *Yours for America.*

One ISM for America
"AMERICANISM"
Citizenship IS A REAL PRIVILEGE
PROTECT IT
"We have room in this country for but one flag ...THE STARS AND STRIPES
We have room for but one loyalty... LOYALTY TO THE UNITED STATES
There can be no 50-50 AMERICANISM ...There is room here for only 100% AMERICANISM only for those who are AMERICANS and nothing else"
Theodore Roosevelt
Sponsored by the
Non-Sectarian League for Americanism
A national non-political, non-profit organization
6 North Michigan Avenue - - Chicago

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Air Raid Damage

A Paper Delivered to the Scottish North-Eastern District Gas Salesmen's Circle at Dundee on November 6th, 1940

By

D. L. Dickson

Reprint from Gas Times, Dec. 14, 1940 Issue

THE subject of air raid damage is one which, at the present time, requires the gas engineer's every attention, and it is one for which we must constantly be on the alert. We do not know what form of damage we may be confronted with and, consequently, we can only prepare in a general manner, making our preparations to meet all possible foreseen conditions and to improvise if necessary and where possible for conditions that cannot under ordinary circumstances be dealt with.

The best known means to combat any circumstances are:

(1) Organisation.
(2) Maintenance of cordial and friendly relations with all groups of A.R.P. workers.
(3) Willingness of all workers to train for such emergencies, taking into full account experiences of any raids that have taken place and the means, adopted by the authorities concerned, to overcome those disturbances.

This paper is not intended to give an account of every possible type of air raid damage; that would be impossible since it would need a much more fertile imagination than mine to draw a picture of the many accidents and conditions which might occur. I propose to deal with a few aspects and in turn to allow you, from those examples, to picture for yourselves how many more varied dangers and troubles could occur.

Gasholders in Air Raids

What would happen if a bomb strikes a gasholder? This is a vexed question, and it is one to which no man can safely give an answer, since it depends on many factors, as follows:

(1) The type of holder.
(2) The state of the holder at the time, i.e.
  (*a*) Its age.
  (*b*) The amount of gas in store.
(3) The type of bomb with which it has been struck and the amount of damage caused.

There are two main types of holders in this country which, between them, store approximately 90 per cent. of the total gas made in Great Britain; these are: (*a*) the guide framed water sealed holder, and (*b*) the spiral guided water sealed holder. Of late another type of holder has been introduced, termed the waterless gas holder.

Let us consider what has actually happened in the South. Splinters from a bomb or missiles caused through a bomb explosion have been hurled at and through a gas holder crown and side sheets, causing gas to escape which became ignited. It was possible, where the hole was not too big, to plug same with wood stoppers and in other cases to cover over with asbestos pads, etc., and patch, but where the hole was too big for a temporary remedy, the gas escaped until the holder level was reduced sufficiently to seal the leak, after which repairs of a permanent nature were made, either by welding or patching.

Where damage to a holder has occurred and it is necessary to put it out of commission temporarily it is safer to seal off the outlet and inlet valves until all repairs have been seen to.

I would mention also the experience of one undertaking somewhere in Britain, where a gasholder received a direct hit. The incendiary bomb on contact with the holder, which was two-thirds filled, burst the side sheets and ignited the gas; two high explosive bombs following penetrated the same lift, burst through the tank plates and exploded in the raft, causing a large hole in the tank; the effect of this was to release the water.

The people in charge, however, with the help of the fire brigade and mobile pumps, averted the danger, and I cite this as an extremely bad case of bombing to show how, with immediate attention and quick thinking, the worst of dangers can be averted.

In general, so far, it has been proved that the gas-holders commonly used in this country are extremely free from danger even under the very abnormal conditions to which they are presently being subjected.

District Conditions

Having dealt briefly with gasholders it is best to consider now damage on the district of a more general nature. In this sphere, organisation is absolutely vital, men must be stationed at various posts, transport facilities must be arranged and stores of materials such as pipes, connections, etc., must be suitably cached, a record of all connections must be maintained and kept up to date. It is also necessary to keep in touch with responsible A.R.P. officials and ensure that everything is being done to make things harmonious and smooth working.

Local knowledge can be a great help, especially where the position of mains and services is vague; where possible, men accustomed to a particular district should be retained for same. As well as this, each post should be equipped with an ordnance survey map for different districts and the position of mains, traps, valves, etc., should be clearly indicated.

Where this is not possible a directory can be made up giving each street in the district alphabetically arranged and giving particulars of size of main, position from kerb, depth, nature of roadway, situation of bag holes, traps, valves and other particulars necessary such as proximity to H.P. mains, whether supplied off a link system, or position of nearest feeder main.

If all those points are noted, lives may be saved through quick action and flames extinguished, which if al-

lowed to burn, would be a further target for the enemy.

Value of Planned Information

To show the value of the foregoing points let us consider them further. On receipt of a message stating that air raid damage has occurred at a certain place, the man in charge of the squad looks up the street referred to from the map, and gets the approximate location. If the main is linked he knows that he can repair the damage with the minimum of inconvenience to consumers; the location shows what connections may be necessary; the nature of the reading determines the excavation tools he requires, whether mechanical or otherwise, and the approximate position of the main at various points, if accurate, saves time of excavation in making bagging off holes.

Furthermore, the position of high pressure or feeder mains in the vicinity would allow of considering alternative means of supply or if, for example, the supply to a works of national importance were badly damaged and it was necessary to feed through a smaller main, the H.P. main might be tapped or a booster connection taken from a feeder main. Too much information, *if it is accurate*, can never be obtained; the better the information at a man's disposal, the easier will be his job and the less danger will result.

Co-operation

Too much stress cannot be laid on f r i e n d l y association with other A.R.P. workers; all are out to do their best and all are needed. The water men can help you and you them, friendly discussions as to positions, etc., of relative mains should take place and every possible assistance mutually given; the same applies with all utilities, sewage, electricity and fire services.

Damage to gas mains has been much more frequent and many reports have been issued dealing with actual experiences. Study of these reports has emphasised many points, and the following is a brief résumé of the most outstanding.

Gas pipes do not suffer alone but nearby waterpipes and electric cables are also damaged; this means that gas instead of escaping may be sealed off by water and, if by any chance electric cables have also been damaged, the danger is further increased due to electrical activity since water is a conductor.

Gum boots are therefore an absolute necessity; it is well to note this, since many people hold that rubber boots are uncomfortable to work in and that where digging is necessary they are a hindrance. This may be so and I agree that leather soled thigh boots may have some advantage in certain respects; nevertheless, any advantage is outweighed by the possibility of the presence of stray electric currents.

Water in Mains

The presence of water is a further danger; due to flooding, mains may become water logged and of course the water flows to the lowest part of the system, so that the gas supply over a large area can be completely cut off. The first step, of course, is to ensure that the water mains are cut off and repair of same commenced, but this may not be possible if the gas main is lower or in such a position that it can only be repaired if done before any obstructions are put in the way.

Once the water is shut off the gas system must be pumped dry, and here it may be necessary to get assistance from the auxiliary fire service, as mobile pump units fixed to stand pipes can do the job much quicker. Here again, districts liable to flooding should be prepared beforehand by fixing suitable connections with adaptors to syphons.

It has also been shown that where both gas and water mains have been damaged care must be exercised before making a permanent job to ensure that all silt, etc., due to flooding is removed from the gas mains. One instance is noted where 50 consumers were cut off completely due to subsoil, etc., being washed forward and services completely choked.

Much expense can be caused to the gas undertaking if burst water mains are not promptly turned off. One might visualise the case of houses situated in a valley, where both gas and water mains were burst and the entire gas system flooded; you would then have your meters, fittings, etc., waterlogged and subjected to a very big increase in pressure and, if the head of water was anyway high, meters, compo connections and fittings generally would be completely ruined and extensive damage caused to private property.

One need only be reminded that for every foot head of water approximately 5 lb. of pressure is thrown (i.e. approx. 14.5 in. w.g.); if the water head is allowed to increase too high, gas meters and soft connections to them would be burst open and completely destroyed, so flooding houses and cellars as well. Once again, therefore, let me emphasise the urgent need for cutting off immediately burst water mains.

It has been shown that it is not always possible where breakage has occurred to cut off the escaping gas by means of A.R.P. stoppers. In some cases the irregularity of the fracture does not permit of those being used. In one instance it was found necessary to first reduce the pressure on the district to a minimum of ten tenths; the broken main was then stopped up with sacking followed by moist clay to a depth of two feet, the flames being extinguished by water from a fire hose.

Excavating for Bag Holes

Excavations for bagging off holes were then made some distance from the crater, bag holes bored and bags inserted, after which the pressure was restored to normal. In the South some undertakings have found it most convenient to brick round certain bagging off holes and leave a cover plate; by this means easy access is assured without the necessary excavation.

Other instances have been reported where bombs did not actually damage the gas main but where falling debris, the result of such explosion, fractured mains for considerable distances. In this connection it was shown that stout leather gloves were of considerable advantage in the removal of the debris. Where such occurs it may be possible with a linked system to bag off the affected part and cap same, leaving the repairs till later.

Other instances are r e p o r t e d where bomb craters had purposely to be flooded in order to cut off escaping gas; this, of course, was with large mains. The many instances which have occurred are extremely varied and all help to emphasise the need of suitable connections and equipment, the maintenance of suitable transport, the value of messengers, especially where telephone communications have been disturbed.

One can go on indefinitely giving instances which have occurred or might occur and describing many devices on the market to assist in the repair of damaged mains. A few of them may be listed as follows:

(1) A.R.P. Stoppers.
(2) H. & C. Repair Coupling.
(3) Wask Main Coupling, etc.

Each of those undoubtedly have points in their favour; the A.R.P. Stoppers might be, and doubtless

are, ideal in certain cases, but they do not fit the bill in every instance, whereas a good supply of clay comes in handy in every case.

Substitute for Couplings

With regard to the two couplings mentioned they are undoubtedly very useful and where they are in stock can be used to advantage; against that it means carrying a large and varied selection of different sizes. In an emergency the same effect can be obtained by slipping a piece of main of a larger size than that fractured to form a long thimble and then roping and leading the joint. To facilitate making a good joint it is quite convenient to have rings made to slip over various sizes of pipes; these rings are very handy even in everyday practice and prevent the yarn being staved through into the interior of the main.

A final point: circumstances might arise whereby consumers in a certain district are deprived of their gas supply. Most consumers are considerate and know that circumstances, over which we have no control, are the deciding factor, hence we do not anticipate adverse criticism through such a failure. What I wish to emphasise, however, is not the cutting off of the supply, but the restoration of same.

Before the supply is turned on again consumers must be warned, the method adopted depending upon the extent of the damage and the area affected. If only a few houses are affected it is a simple procedure to warn each consumer separately, but if a larger number the services of the A.R.P. bodies might be organised to cover all the area going from door to door. If the area is much larger, however, either of the foregoing methods is useless and it would be necessary to utilise the services of a mobile loud speaking van or vans to cover every street, in order to avoid delay and prevent accidents.

When each gas engineer realises individually the immense cost which enemy air raiding entails, plus the damage that accrues, we shall each do better than ever to allow of our undertakings meeting every requirement so that this may emerge triumphant and at the end of the war be in a position to take up where they left off at the outbreak of hostilities and, if anything, be in a better position due to the good will and kindly spirit engendered by the trying time imposed upon all.

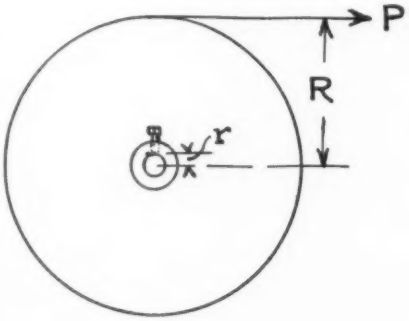
Why Set Screws Slip

By
W. F. Schaphorst, M.E.,
Newark, N. J.

After a set screw slips, no amount of tightening will prevent slip if the set screw is too small. A slipping set screw is either too small or it is not tightened sufficiently.

Set screws are commonly called upon to pull entirely too much. It is amazing what is expected of them. When you consider that belt pull P as shown in the accompanying sketch is usually in the hundreds of pounds and often in the thousands of pounds and when you consider the great leverage it generally has on the set screw, the wonder is that set screws do not slip more than they do.

To compute the force that a set screw must resist, proceed as follows:



(1) Multiply the horse-power by the radius R in inches and then multiply by 33,000.
(2) If it is a belt drive, multiply the velocity of the belt in feet per minute by the radius r in inches.
(3) Divide (1) by (2) and you have the force in pounds that the set screw must resist.

If it is a gear or chain transmission the same rule applies. The principal factors that need be known are, as enumerated above, the horse power; the velocity of the belt, chain, or pitch circle of the gear; the radius R; and the radius of the shaft, r.

After knowing the force that the set screw must resist the following rule will be found useful to make certain that the set screw is large enough: Extract the square root of the force in pounds and divide by 40. The result is the diameter of set screw in inches.

Or, if you want greater refinement use this table:

d (in.) =	1/4	5/16	3/8	7/16	1/2	9/16
P (lb.) =	100	168	256	366	500	658
d (in.) =	5/8	3/4	7/8	1	1⅛	1¼
P (lb.) =	840	1280	1830	2500	3288	4198

Thus for example if you get 2400 lb. as the answer a 1" set screw will be required according to the table. Or, two set screws, each ¾ in. in diameter. The rule gives a set screw 1¼ in. in diameter.

Public Service Electric and Gas Co. (N. J.) Extension

A major item in the $2,500,000 budget of the Gas Department of Public Service Electric and Gas Company is for the further expansion of the facilities at the West End Gas Works, Jersey City, the program for which was started in 1940. The gas-making apparatus at this plant is being modernized and the efficiency and economies effected will be equal to those at the Harrison Works, which is one of the outstanding water gas plants in the country. Ultimately the daily capacity of West End Works will be 30,000,000 cubic feet of gas.

THE GOODMAN STOPPER

Now has the "Z" handle for easy manipulation. When locked in place it holds. Stopper cannot slip. Gas cannot pass. Adjusted in 30 seconds.

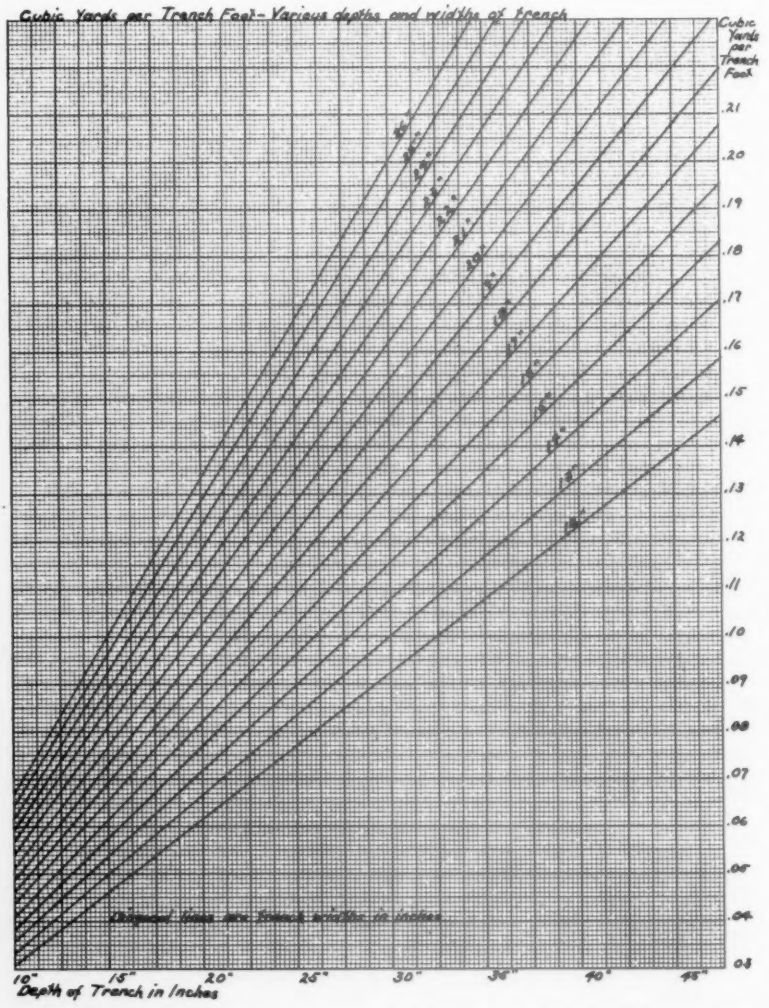
Ask for circulars on this and other distribution equipment.

Nearly a half century of service to the Gas Industry.

The Reliable Shut-Off for Street Mains

Safety Gas Main Stopper Co.
523 Atlantic Avenue, Brooklyn, New York

Cubic Yards Per Trench Foot for Various Widths and Depths of Trench



By **J. L. Turner**

The accompanying chart has been found to be a handy aid in expeditiously figuring the cost of trench excavation or backfill. The fractional part of a cubic yard per one lineal foot of trench for various widths and depths of trench commonly encountered in ordinary pipe line work have been computed and plotted on this chart in order to obviate laborious calculations. By means of this chart, the difference in volume and the resulting difference in cost for alternate depths of cover over a pipe line will be made more apparent. The readings from this chart will be found to equal slide rule accuracy.

In using the chart, first pick out the depth of the trench in inches on the horizontal scale and follow the line of the determined depth in inches vertically until it intersects the diagonal line representing the trench width in inches. Opposite, and to the right of the intersection of the lines of depth and width will be found the decimal part of a cubic yard for one lineal foot of trench.

United Gas Pipe Line Company

Extensions

To serve new customers, to tie-in new gas fields and to further insure that the natural gas service provided by United Gas Pipe Line company shall be dependable, workmen constructed more than 100 miles of transmission line during 1940 in various sectors of the system and an additional 14 miles were added by purchase.

Largest construction job of the year was the Lirette-New Orleans line which connected the gas reserves of the Lake Long and Lirette fields in South Louisiana to the Baton Rouge-New Orleans main loop line. A multiple Mississippi river crossing nearly two miles in length was also constructed as a part of this line.

In the Company's Baton Rouge district the construction program of the Louisiana highway commission necessitated the lowering of six lines. Seven-tenths of a mile of line was relocated around the new round house of the L. & A. railroad. The changes had the effect of putting the district's transportation system in an excellent position to take care of future sales loads.

To bring natural gas from the Willow Slough, Sea Breeze and Labelle gas fields in Southeast Texas into the Goodrich main transmission line construction of nearly 20 miles of line was necessary.

During the summer, Brooks field, United States military reservation near San Antonio, Texas, was tied-in to United's lines. Built in 1916-17 as a primary aviation training school, the field was scheduled for abandonment in 1939, but when the National Defense program was initiated, the facilities of the school were found necessary and will even be enlarged. Construction of 1.31 miles of line was completed to serve the field.

In July the Koran plant was completed. Construction was started January 29, 1940, and the plant is now capable of processing 60,000,000 cubic feet of gas daily and will produce 12,000 gallons of stabilized gasoline and 6000 to 8000 gallons of commercial grade gasoline each day.

Gas reserves of the Abbeville field in the Southwest Louisiana district were tied-in to United's system early in December with the completion of 12 miles of line.

In the Joaquin-Logansport field, Dallas district, where Union Producing company completed two large gas wells during the year, a gathering system was constructed and tied-in to the system after more than 8 miles of line were laid to the Latex-Beaumont main line of United.

Pipe line crews were also kept busy throughout the year rearranging and reconditioning lines and building measuring stations throughout the Company's 6,443.99 mile system of transmission and gathering lines.

Pressure Control and Booster Systems

By

W. L. Lyon

General Manager, Norwalk Valve Co.

THE OBJECT of this article is to give a general idea of gas pressure control and booster systems to utility men whose specialty is not gas distribution. In order to understand these systems it is necessary first to have a thorough understanding of the principle on which simple pressure regulators work.

The zero shown on an ordinary pressure gauge does not show the point where there is no pressure, but the point where there is ordinary atmospheric pressure. On a gauge showing a perfect vacuum, or no pressure, as zero, the customary reading at sea level would be 14.7 pounds, or about 30 inches of mercury, as shown by a barometer. Since ordinary atmospheric pressure is 14.7 lbs. per sq. in., gas pressure which registers on a water gauge 7″, or 4 oz., or ¼ lb., or .25 lb., amounts to actual or "absolute" pressure of .25 plus 14.7, or 14.95 lb. per sq. in.

The valve in a simple regulator will come to rest at the point where it allows enough gas to pass so that the outlet pressure will exactly balance atmospheric pressure plus added weight or spring tension. The force pushing up on a simple diaphragm regulator is the regulated pressure, or the pressure after the valve. The force pushing down on the diaphragm is the atmospheric pressure of 14.7 lb. per sq. in., or 147 lb. on an effective diaphragm area of 10 sq. in. If no weight or spring tension were placed on top of the diaphragm, the outlet pressure would be the same as the atmospheric pressure plus a slight increase due to the weight of the valve and diaphragm assembly, which I will consider as part of the added weight mentioned. In order to keep the valve of the regulator open and maintain a regulated pressure of anything more than atmospheric pressure, or zero gauge pressure, it is necessary to add to the force pushing down. If an object weighing 2½ lbs. is placed on top of the diaphragm, the force pushing down will amount to 149.5 lbs. or 14.95 lbs. per sq. in. so the valve will open enough to allow an equal force pushing up under the diaphragm. This will make the regulated pressure 14.95 lbs. per sq. in., or .25 lb., or 4 oz. above atmospheric pressure, still, of course, assuming 10 sq. in. of diaphragm area.

An increase in pressure on the inlet side will not increase the pressure on the outlet side of the regulator because the valve will start to close when the outlet pressure starts to increase. A decrease in pressure on the inlet side will not decrease the outlet pressure because the valve will open, assuming that the inlet pressure is always higher than the amount of outlet pressure for which the regulator is weighted. The inlet pressure is only limited by the strength of the diaphragm.

TYPICAL DIAPHRAGM REGULATOR

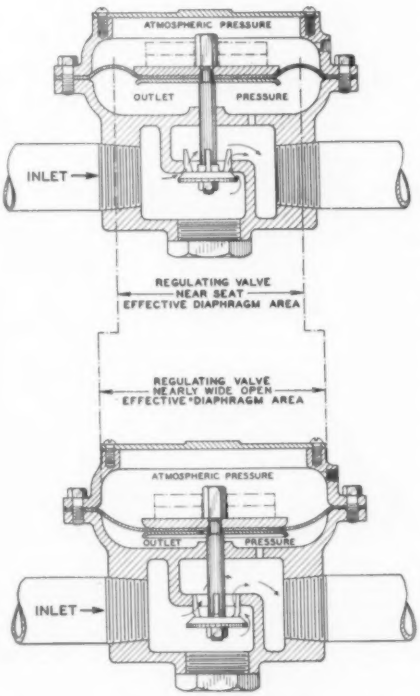


Figure 1—Simple Regulators in Open and Closed Positions.

Since the ordinary gauge pressure at the outlet increases or decreases in direct proportion to the weight on top of the diaphragm, it is obvious that, with an effective diaphragm area of 10 sq. in., a 5 lb. weight would be necessary for an 8 oz. outlet pressure, or a 1¼ lb. weight for a 2 oz. outlet pressure. Of course the weight of the diaphragm assembly must be subtracted from the amount of weight to be added. The thing to remember is that the outlet pressure will be that which is sufficient to balance the force exerted on the top of the diaphragm by atmospheric pressure plus added weight or spring tension.

The reason for referring to "effective diaphragm area" instead of simply "diaphragm area" is that the pressure under the diaphragm can not use all of the diaphragm to lift the valve and that the portion of the diaphragm useful for this purpose changes with the position of the valve. When there is enough change in demand, or rate of flow through a diaphragm regulator, to cause a large up and down movement of the valve, the effective diaphragm area changes to such an extent that there will be considerable variation in the outlet pressure. When the valve is in a position which puts the center of the diaphragm in the same plane as the circumference of the diaphragm, the effective area of the diaphragm may be determined by using the distance from the center to the top of the bulge of the diaphragm as a radius. When the valve is in a position which puts the center of the diaphragm above or below the circumference, it is obvious that a greater part of the diaphragm than that covered by this radius is acting as a lifting element and that the effective area of the diaphragm is, therefore, increased. For this reason, it is desirable to have the valve move as short a distance as possible.

Suppose that 2½ lbs. of weight will set a regulator for an outlet pressure of .25 lbs. when the flow is small, the valve nearly closed, and the effective diaphragm area 10 sq. in. Increased load, causing the valve to open almost wide, may increase the effective diaphragm area to 12 inches, so that the force pushing up in addition to atmospheric pressure is .25 times 12 or

3 lbs. Since only a 2½ lb. weight is on top, the valve will close until a balance is reached and the outlet pressure will be 2½ lbs. divided by 12, or .208 lbs., or more than an inch (water column) less than the desired pressure. When the maximum flow through a regulator is to be more than three times the minimum normal flow, a simple diaphragm regulator will not maintain a constant outlet pressure. It is generally understood that decreasing the weight on the diaphragm will decrease the outlet pressure but it is not generally understood that a wide opening of the valve, due to increased demand, will have the same effect. When the flow increases, pressure loss after the regulator increases because of friction so it is doubly bad to have the outlet pressure decrease at the regulator during peak load.

Control Systems

In pilot pressure regulation systems, the main regulator is controlled by one small regulator in which outlet pressure is balanced against the force of atmospheric pressure plus weight or spring tension. The reasons for the existence of pressure control systems are as follows:

1. Large regulators do not maintain uniform outlet pressure at various rates of flow because of unbalanced conditions due to change in effective diaphragm area.

2. A regulator with a small flow passing through the valve and a small movement of the valve is much more accurate than a regulator in which there must be a large up and down movement causing major changes in the effective diaphragm area.

3. It is sometimes necessary to have the outlet pressure higher at the regulator outlet during peak load than when the demand is low in order to maintain a uniform pressure in the district.

Pressure Controller Unit

This type of unit is designed to hold a constant outlet pressure over a very wide range of flow and has an adjustable pressure range of 10 to 1, minimum to maximum. Each turn of the spring tension handle should change the outlet pressure by exactly 10%, so the same position of the handle should always mean the same pressure. For instance, if the outlet pressure range is 4″ to 40″, each turn should change the pressure exactly 4″. This is important on ovens or other processing applications where different pressures are required for different products or for different periods.

In some control units the gas will be shut off entirely if the inlet pressure drops below the outlet pressure setting, while in other types of unit the outlet pressure will simply become practically the same as the inlet pressure until the inlet pressure returns to normal.

In this type of Controller, the actual regulating is done by the small valve which moves such a short distance that the effective diaphragm area is unchanged. There is practically no strain on the diaphragm in the main regulator because there is very little difference between the pressure above and below the diaphragm. Since the stem is hollow, the pressure would be exactly the same above and below the diaphragm

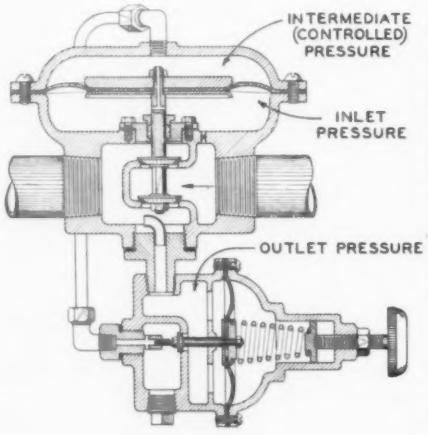


Figure 2—Pressure Controller Unit.

if it were not for the fact that a small amount of gas is bled off from the top by the small regulator, creating a pressure differential above and below the main diaphragm which will control the position of the main regulator valve. (The movement of the diaphragm in the small regulator is so slight that no vent is required, other than the natural leakage around the thread of the valve handle. Actually, a 1/32″ vent hole is used.)

When the inlet pressure increases, the increase in the outlet pressure will hold the small diaphragm valve shut until the intermediate pressure has built up above the main diaphragm enough to close the main valve to a position which will correct the situation.

If the small regulator valve were to remain entirely closed, the large regulator valve, which seats down, would be kept closed by the force of gravity since inlet pressure would be both above and below the large diaphragm.

A decrease in the outlet pressure, below the point for which the spring adjustment is set, will open the small valve, reducing pressure above the main diaphragm, so that the inlet pressure will lift the main valve off its seat. To keep the main valve off its seat, gas must pass through the valve of the small regulator a little faster than it passes through the hollow stem of the main diaphragm.

The small regulator balances outlet pressure against atmosphere plus spring force, like an ordinary regulator. The large regulator is operated by inlet pressure balanced by automatically reduced inlet pressure.

Pressure Controller System

The principle described above may also be used for district regulators on distribution systems, when no boost is required during peak load. When so used, the small regulator may be located several feet away from the large one and it may be the lever and weight type or the dead-weight type instead of the spring type. When this system is used with high pressures or with very large main regulators, a spring may be used at the top of the stem of the main regulator in order to assist gravity in closing the large valves absolutely tight when necessary.

Mechanical Booster System

This system works like the pressure controller unit except that the main regulator and the control regulator are set side by side and the stems of the two regulators are connected by levers so that when increased load causes the valve of the main regulator to open and the stem to move, the spring tension is increased on the control regulator. This causes an increased outlet pressure at the regulator while the demand is high and gives a nearly uniform pressure in the district, even during peak load.

Pressure Booster System

This is similar to the mechanical booster system but, instead of increasing the spring tension on the control regulator during peak load through a lever connected to the stem of the main regulator, it increases the tendency of the control regulator to open by using a second small regulator which is controlled by the pressures on the two sides of an orifice in the downstream line. An increase in flow will increase the pressure differential across the orifice, causing the valve of the second control regulator to open and the valve stem, which is directly connected to the valve stem of the control regulator, to

go down. This tends to open the value of the small regulator, open the valve of the large regulator and make outlet pressure at the large regulator higher when the demand is great than when it is small.

This system is not as satisfactory as a mechanical booster system except when there is considerable difference at all times between inlet and outlet pressures.

Pressure Balanced Regulator System

This system has no advantage over the pressure controller system when uniform pressure at the regulator is all that is required but it may be used to keep pressure uniform at a distant point by piping the outlet gas from that point to the space over the control diaphragm, or by placing the control regulator at a distant point. It may also be used to make outlet pressure vary in proportion to air supply pressure by piping the air pressure to the lower chamber of the control regulator where there would otherwise be atmospheric pressure. The large regulator works on the principle of balancing outlet pressure against automatically reduced inlet pressure or intermediate pressure. The intermediate pressure is kept at the right point by a control regulator which balances outlet pressure against atmospheric pressure, plus spring tension, regulating the intermediate pressure so that, to keep the valve of the main regulator open, more gas must pass through the valve of the small regulator than can get out of the vent of the large regulator without building up a pressure in excess of the outlet pressure. When inlet gas is piped to the inlet of the small regulator, gas must be vented from the top of the main regulator to atmosphere but the amount vented is only about four cubic feet per hour when the outlet pressure is one pound. If air pressure is available at more than outlet pressure, it can be used instead of gas at the inlet of the control regulator and only air will be vented from the top of the main regulator.

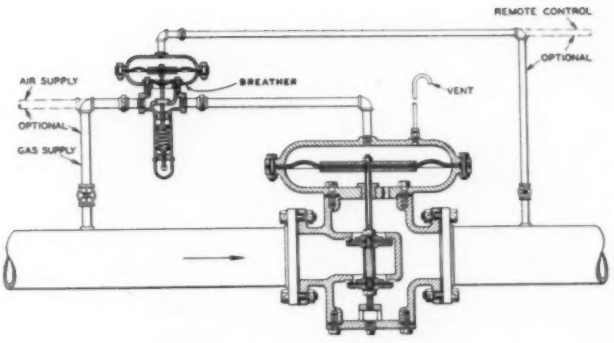


Figure 3—Pressure Balanced Controller.

Auxiliary Pilot Controller System

The principal object of this system is to eliminate the outlet pressure variation due to the changing effective diaphragm area on a large standard regulator, without replacing the regulator.

The main regulator is set with weights for a pressure about 10% below that which is desired. The control regulator supplies a balancing pressure to replace outlet pressure in the chamber above or below the diaphragm of the main regulator. This pressure is controlled by a small regulator in which the effective diaphragm area does not change. It acts like a watchman instructed to add weights to the main regulator when the movement of the valve causes the effective diaphragm area to increase and to remove them when the effective diaphragm area decreases. Since the control regulator simply controls the pressure beyond that for which the main regulator is set with weights, the main regulator would still supply a safe outlet pressure if the control regulator, for any reason, should stick either shut or open.

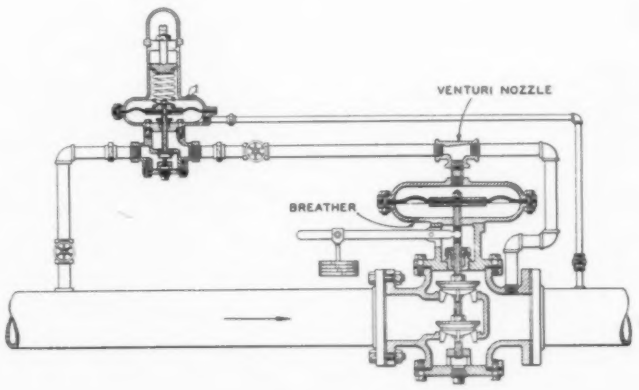


Figure 4—Auxiliary Pilot Controller.

In order to understand this system, it is necessary to understand the venturi principle, as the equivalent of additional weight on the main regulator is caused by a decreased pressure over the main diaphragm which is created by the venturi action of the stream of gas passing from the inlet through the control regulator and venturi nozzle to the outlet side. A restricted nozzle on a gas line, creating a small stream of high velocity gas, will cause a low pressure area around the nozzle because of the tendency of the gas there to follow the high velocity stream. As the pressure differential increases through the nozzle, the suction increases and the pressure around the nozzle decreases. The large regulator is controlled by automatically decreased outlet pressure against atmosphere plus weight. The control regulator determines the amount of additional lift given to the main diaphragm and so does the actual regulating. Since the small regulator is controlled by outlet pressure against atmosphere plus weight or spring tension, the outlet pressure may be taken from a distant point if this is desirable.

Studies in Microbiological Anaërobic Corrosion

Part 2

By

Raymond F. Hadley

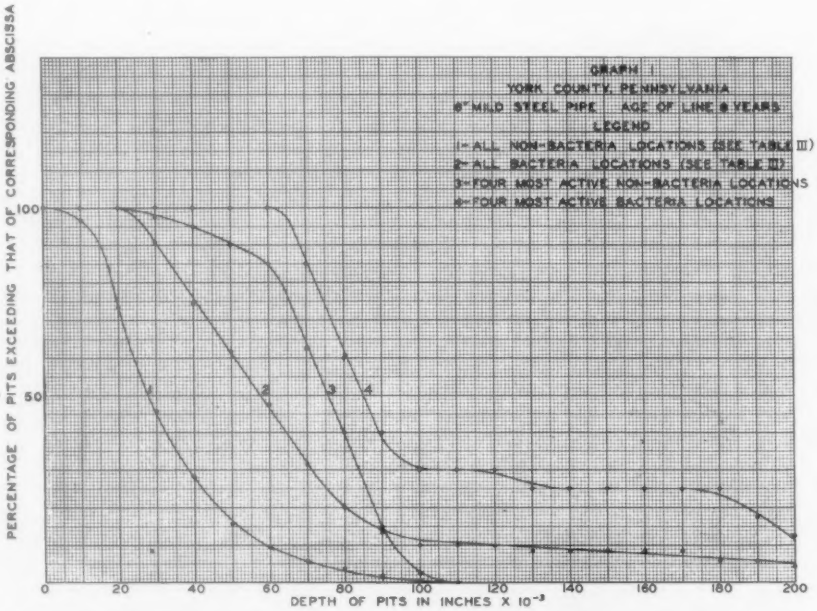
Susquehanna Pipe Line Company,
Philadelphia, Penna.

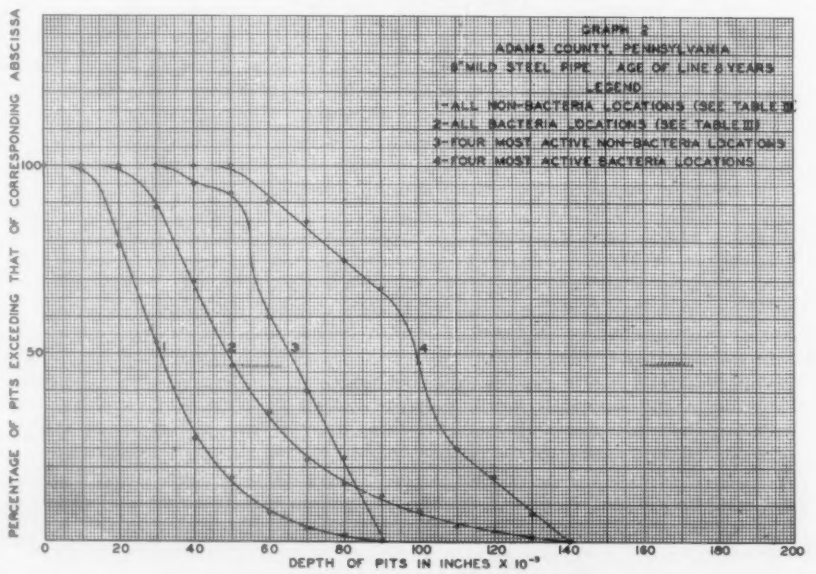
The Practical Aspect of Microbiological Anaërobic Corrosion

Thus far, although a considerable quantity of data has been presented in regard to the microbiological anaërobic corrosion process, very little attention has been given the practical aspect of this corrosion. Obviously, if this corrosion process proceeds at a negligible rate, or is a process of the "self-stifling" variety, the serious consideration that would have otherwise been given it, is not then warranted. Let us examine, therefore, the data in order that the severity of this corrosion may be evaluated in terms of other corrosion processes.

Data are presented in Table III relative to the pit distribution curves of graphs 1-4. These data represent some of the recent information obtained from one of our field pipe line inspection parties, and were selected at random from our files. The information noted for each county refers to a continuous progression of pipe line stations, that is, the data for the pipe inspection holes in which bacterial activity was found, and the pipe inspection holes where bacterial activity was absent, are from the same section of the county. These locations were selected because they represent some of the latest data available, and not because of any corrosion characteristic, in fact, none of the locations where the most active bacterial corrosion was found are included in these data. The Adams and Franklin County locations, being in the foothills of the Allegheny Mountains, are actually sections of very favorable soils, where the corrosion should be a minimum. The location in Onondaga County was the one section of the pipe line system where we, somewhat erroneously, believed microbiological anaërobic corrosion would be absent, as the soil is composed chiefly of glacial sand. The data contained herein pertains only to water test holes,* which represent, for the most part, the locations where "hot spots" are found.

The curves of graphs 1-4 were plotted from pit depth measurements made at the locations noted in Table III, the 10 deepest pits occurring at each location being used as a basis for the computations. Since the lengths of pipe inspected in each of the test holes were approximately equal (average value noted in Table II) it is felt that the conditions under which the data were taken are sufficiently uniform to be used as a basis for comparing the severity of microbiological anaërobic corrosion with other better known forms of corrosion processes occurring at the same geographical locations. In studying the curves of graphs 1-4, it is of interest to note that the corrosion associated with microbiological anaërobic sulphate-reduction is in each





instance more severe than the corrosion encountered in locations where this bacterial corrosion is absent. In other words, since the data was obtained from interspaced locations in one small geographical unit, i.e., a county, we may conclude that any difference in shape, or area, of the curves must result from the *vera causa* of this FeS occurring in the corrosion products. We can then say that curve 1 includes all corrosion processes except those responsible for the formation of FeS and curve 2 includes all corrosion processes included in curve 1 PLUS the corrosion process responsible for the precipitation of FeS, therefore, the differences in area between these two curves must represent an evaluation of the microbiological anaërobic corrosion process in terms of the other corrosion processes encountered through those counties from which

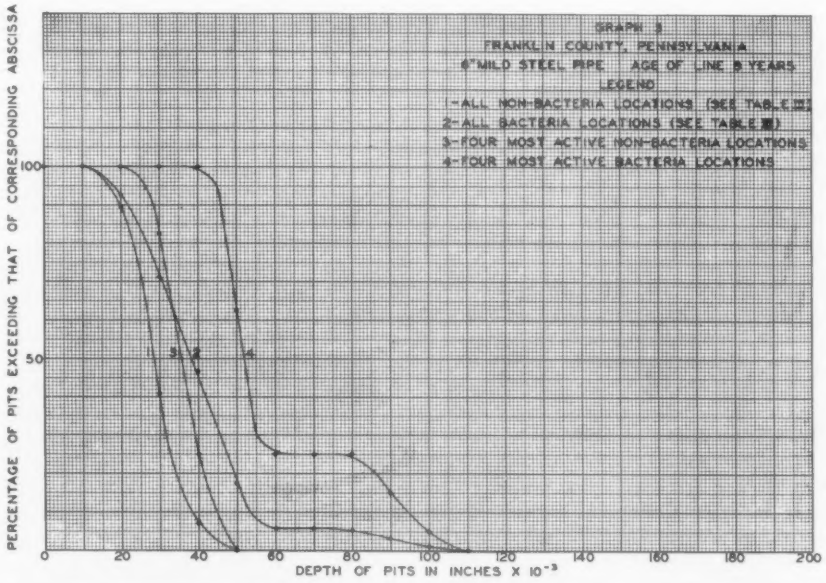
TABLE III

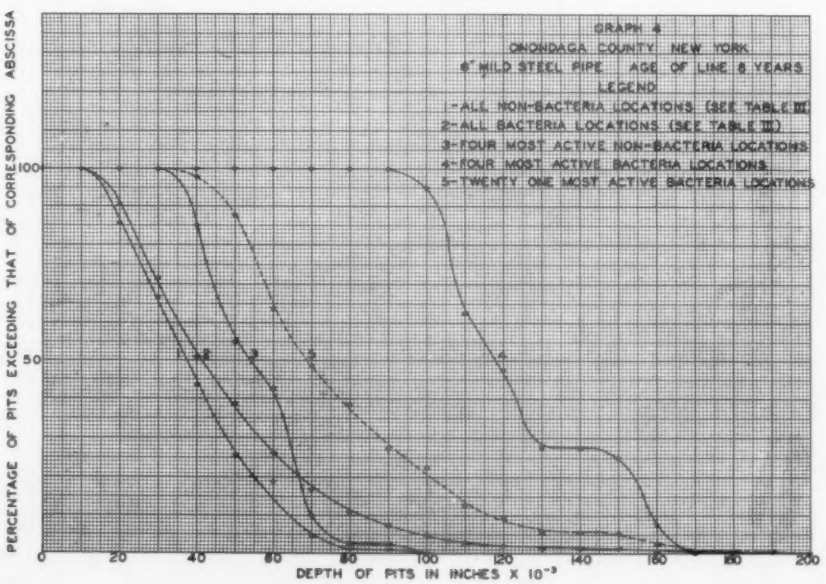
County & State	*Total number of water inspection holes**	*Number of locations bacteria active (FeS)*	*Number of locations bacteria not active (no FeS)*	*Number of pits used from locations where bacteria were active*	*Number of pits used from locations where bacteria were not active*
Adams, Pa.	82	28	54	525	278
York, Pa.	57	12	45	110	439
Franklin, Pa.	33	19	14	190	140
Onondaga, N. Y.	107	98	9	980	90

* Water test holes are pipe line inspection holes containing sufficient water for the collection of a 250 ml water sample from a well dug in the bottom of the test hole.

TABLE IV

Location	*Nominal diameter of pipe*	*Length of pipe measured Inches*	*Uncorroded area / Corroded area*	*Pitting factor*
Akron Spur Station 200 Summit Co. Ohio	3"	12	1.611	1.6
Main Line Station 263 Summit Co. Ohio	6"	8.5	0.805	1.7
Main Line Station 263 Summit Co. Ohio	6"	7.0	0.447	1.8





this data was obtained. In view of the inherent difficulty of separating microbiological anaërobic corrosion from other corrosion processes occurring in similar neutral, or nearly neutral, soils such an evaluation may possibly represent the most satisfactory method for determining the severity of the microbiological anaërobic corrosion process.

Having shown that the pit depth distribution of microbiological anaërobic corrosion is much more likely in a given time to cause ultimate perforation of the pipe, even in counties where conditions are not particularly favorable for the growth of the sulphate-reducing bacteria, let us examine the physical appearance of the pipe surface resulting from the bacterial corrosion process. The investigation of a great number of locations by members of the electrolysis department of our company indicate that locations in which the sulphate-reducing bacteria are especially active (pipe coated with thick layer of FeS) are nearly always associated with large areas of metal removed from the pipe surface, areas in fact so large that they can be no longer be called pits. These slabs are generally of such large area as to make their depth measurement impossible without the use of an especially constructed slab measuring bar for use with the pit depth micrometer. The extent of this slabbing is closely correlated with the degree of anaërobiosis and activity of the sulphate-reducing bacteria i.e., the more favorable the location for the growth of the sulphate-reducing bacteria the larger the area of the metal attacked, and conversely, the less favorable the

conditions for the growth of the sulphate-reducing bacteria the more nearly the slabs approach the shape and size of true pits.

The foregoing statements are not meant to imply that for all locations where FeS is found in the corrosion products the pipe need necessarily be severely corroded. The degree of corrosion and the quantity of FeS found in the corrosion products will be largely dependent upon the activity of the sulphate-reducing bacteria; consequently, variations in any of the factors affecting their metabolic processes will thus, in a secondary manner, affect the corrosion and precipitation of FeS. Of the several factors influencing the growth of the sulphate-reducing microorganisms, oxygen tension, pH, and organic content of the environment, appear to be the most important factors in determining whether or not bacterial growth will take place. Each one of these factors has certain limits enclosing the region of optimum bacterial growth and outside of which bacterial growth is inhibited. It is thus possible to visualize locations where all these factors may be inside, or outside, of these optimum growth limits. In the first case severe corrosion would be anticipated, associated with large quantities of FeS in the corrosion products; in the second case, corrosion of a minor degree could be expected with little, if any, FeS in the corrosion products. In the same manner, any one of these factors deviating from the optimum bacterial growth limits will tend to inhibit the metabolic processes of the sulphate-reducing bacteria, the degree of inhibition being determined by the sensitivity of the bacteria to that factor, and the magnitude of deviation of that factor from the optimum value.

In substantiating the statements relative to the slabbing of the pipe in locations where conditions favored the growth of the sulphate-reducing bacteria, several measurements were recently made of the uncorroded to corroded area ratio of three small pieces of pipe removed from two locations in Ohio where the sulphate-reducing bacteria were particularly active. Unfortunately, although typically representative of microbiological anaërobic corrosion, these samples were of necessity quite small, being specimens of pipe stored in the laboratory. The results of these measurements, however, confirm observations which have frequently been made in the field by several of the investigators of our company. The data obtained from these measurements are shown in Table IV.

It may therefore be seen that any comparison made between the condition of the pipe in a location where the pipe is undergoing active bacterial corrosion and the condition of the pipe in a location where bacterial corrosion is absent, by the measurement of pit depths, favors the condition of the pipe in the location where the bacterial corrosion was not present; for although the pit depths in each of the two locations may be the same, the metal loss of the pipe is considerably greater at the location where active microbiological anaërobic corrosion is in progress. This characteristic corrosion difference is in itself a problem worthy of consideration, particularly so when the lines are operated under high pressure, for the hoop stress per unit area is not materially increased by the occurrence of a pit. In the case of a slab, however, this stress may have increased many times over the desired working value. A corrosion failure of a pipe by external pitting ordinarily occurs as a small pinhole blowout in the crown of the pit, whereas in the slab type of corrosion the failure occurs as an axial pipe split, even with seamless pipe.

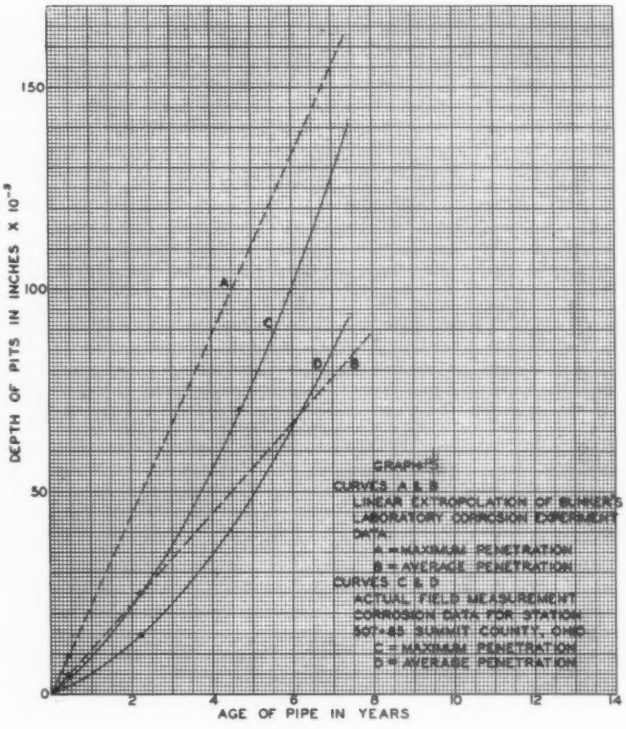
Pit Depth-Time Curves of Microbiological Anaërobic Corrosion

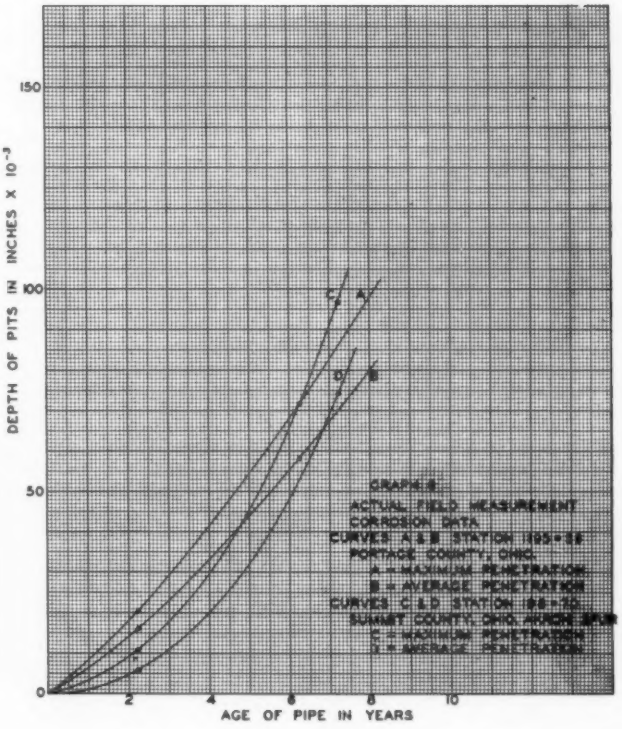
It has been noted elsewhere in this paper, that if the microbiological anaërobic corrosion process were of the "self-stifling" variety it would not demand the attention that might otherwise be given it. The activity of such a corrosion process diminishes due to the formation of an impervious ferric hydrate membrane, and therefore, we should expect to find a relatively high percentage of the corrosion products oxidized from the ferrous to the ferric form, if the microbiological anaërobic corrosion process is to be considered of the "self-stifling" variety. An oxidation of this kind would ordinarily occur only where the oxygen diffusion rate is relatively high, and since we have shown that oxygen is not available to the anodic and cathodic surfaces because of the degree of anaërobiosis, due to bacterially formed H_2S, it does not therefore seem commensurate with the observed facts (Table I) to believe that this impervious membrane could be formed. We should therefore expect the microbiological anaërobic corrosion penetration to continue on a linear, or some other more complex curve. The results of many visual observations, and several sets of comparative measurements, definitely indicate that the penetration of the pipe by this bacterial corrosion process is not linear, but instead follows a rather pronounced increasing rate cuve. The shape of the pit depth-time curves, at three different locations undergoing active microbiological anaërobic corrosion are shown in graphs 5 and 6.

The sketchiness of the data from which the curves of graphs 5 and 6 were plotted (two measured and one zero value for each curve) naturally precludes the drawing of any concrete conclusions from these curves. However, since the curves are all of the same type and substantiate the illative results drawn from many visual observations of the pipe in locations where serious bacterial corrosion occurred, it is believed that they are of value in illustrating the change of corrosion rate with time in typical locations where active microbiological anaërobic corrosion is in progress. The comparative data for each curve were obtained from the identical location, the second pipe inspection hole being dug to include one half of the original test hole and one half of undisturbed backfill.

In submitting graphs 5 and 6, which illustrate several increasing rate pit depth-time curves, the writer is aware that most corrosion investigators are unwilling, or reluctant, to accept such curves as reliable. It is reasonable to believe that data have been gathered from many locations which would substantiate these curves, however, much of these data have probably been discarded as unreliable, if not "freakish." Pit depth-time or weight loss-time relationships the rate of which increases with time, are not incompatible with the microbiological anaërobic theory of corrosion, although they are with the other forms of corrosion processes; on the contrary, such a relationship is precisely what one would expect from the microbiological anaërobic corrosion process under optimum conditions for bacterial growth. It is, therefore, suggested that such data, if obtained, be examined from the microbilogical aspect of corrosion, and not discarded because of its lack of correlation with similar data obtained from other types of corrosion processes.

In examining the literature for examples of pit depth-time or weight loss-time curves illustrating this increasing rate characteristic of the microbiological anaërobic corrosion process, an excellent example has been reported by Martin in analysing the corrosion time relation of the rolled ferrous specimens used in the twelve year field tests conducted by the National Bureau of Standards.





Of the forty-one soils reported in this test, eight showed the rate of weight loss to increase with time. Several pages, of the above mentioned paper, are devoted to these data in an effort to justify a disbelief of any such relationship. Martin states, "For the rate of growth of either* to increase with time, while it is not impossible, is hardly to be expected." Seven of these eight soils are thus discarded, since u† does not exceed unity by more than two standard errors. The other soil, to quote, "In soil 33, however, the computed value of u exceeds unity by 6.2 times its own standard error. In this case, therefore, we must seek further for an explanation or assume that the rate of loss of weight actually does increase with time." The writer is not familiar with any of the above mentioned forty-one soils, however, it would be most interesting to examine the eight soils referred to from the microbiological aspect of the anaërobic corrosion process.

Another location in which the rate of pit depths shows an increase with time has been reported by Logan, the increasing rate pit depth-time curve referred to is from site XVI, one of the three most corrosive soils of the A.P.I. tests. There are, no doubt, many other papers which have escaped the writer's attention that contain data which would further substantiate these increasing rate pit depth-time or weight loss-time curves.

The writer wishes to specifically point out that the increasing rate pit depth-time relationship discussed above, the substantiation of which included graphs 5 and 6, is not necessarily meant to imply that such a relationship will be found at ALL locations undergoing bacterial corrosion. This increasing rate pit depth-time characteristic has repeatedly been noted for many locations other than those included in graphs 5 and 6, however, the locations where this characteristic has been found were extremely favorable locations for the growth of the sulphate-reducing bacteria. This, of course, represents only a small percentage of the locations in which bacterial corrosion may be in progress. It is not reasonable to believe that in locations, where one or more of the factors affecting the bacterial metabolic processes deviate appreciably from the optimum growth values of those factors, that this increasing rate pit depth-time relationship will exist.

The dotted lines A and B of graph 5 illustrate a linear extrapolation of the results obtained from laboratory experiments carried out by Bunker. In this experiment Bunker exposed mild steel discs to a nutrient lactate-sulphate solution inoculated with pure cultures of *Sporovibrio desulfuricans* for a period of 156 days. The nutrient solution was replenished nine times during the duration of his experiment, thus assuring optimum conditions for the growth of the sulphate-reducing bacteria.

Fig. 1—Typical location where active microbiological anaerobic corrosion may be expected.

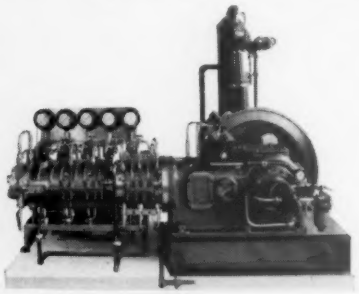
Part 3, concluding this article will appear in the March issue

* Pit depth or weight loss.
† $W = k'T^u$.

New Equipment and Appliances

A New 15,000-Lb. 5-Stage Compressor

Clark Bros. Co., Inc., Olean, New York, makers of compressors for industrial service, have announced a new horizontal compressor for air or gas which will handle pressures up to 15,000 pounds per square inch. The new unit is small, compact and adaptable to any type of drive. It is particularly suitable for use by chemical and oil companies, research laboratories and schools where special processes are employed involving air or gas compression. Clark also offers high-pressure compressors in other sizes.

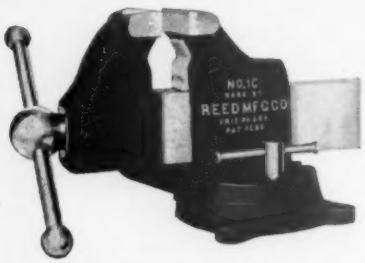


15,000 lb. Clark Compressor

Clark Bros. Co., Inc., has been an outstanding leader in the development of high-pressure compressor equipment for the oil and gas industries, particularly in the fields of pressure maintenance, gas recycling, refining, and oil and gas pipe line operation.

New Reed Equipment

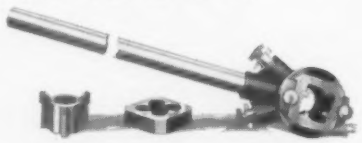
Shown here is the Reed Combination Vise. The pipe jaws have a long bearing to prevent marring or crushing the pipe, but do not extend beyond the face of the main jaws which are used as a machinist's vise. Facings of all jaws are of high quality alloy tool steel.



Reed Combination Vise

The swivel base is provided with a taper headed lock bolt with strong lugs which interlock with recesses in the base. Four sizes for pipe ⅛" to 6".

Below is shown the Reed standard ratchet stocks and dies made for pipe sizes ⅛" to 2".



Reed Standard Ratchet Stock

The patent double-threaded throat starts cutting without hard pushing effort. Dies will thread iron, steel or brass pipe equally well. It has two pawls which act alternately to reduce lost motion and permit operation in restricted space. Easier to operate than a two handled stock.

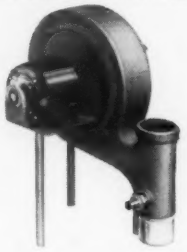
Fuller information on both the above from Reed Manufacturing Co., Erie, Pa.

Air Conditioning Unit

The Vacuum Gas Appliances Division of The Union Fork and Hoe Company, Rome, New York, announces the "Gas-Vac" winter air conditioning units with inputs of 50,000, 81,000 and 110,000 B.T.U., and is designed to operate on any type of gas. These conditioners are equipped with approved safety pilot, room thermostat, limit and fan control, Minneapolis Honeywell valve, and vacuum safety valve.

Gas-Vac Air Conditioner

This equipment does not depend on the conventional chimney for draft. Combustion is supported by a small vacuum exhauster which maintains a partial vacuum on the unit, drawing air for combustion into the burners, premixed with the gas. A flame temperature of well over 2000 degrees is obtained, this heat being carried through baffled cast iron heat exchangers, which transmit 95% or more of the heat in the gas to the air which travels over the heating elements and makes it available for useable heat at the bonnet with the conditioner.



Vacuum Exhauster

The products of combustion are cooled to the point of condensation, and flue temperatures run as low as 160°.

Inasmuch as combustion is supported by vacuum instead of chimney draft, there are no down draft problems.

The manufacturer offers a guarantee of 95% delivery of the heating value of gas burned for useable heat.

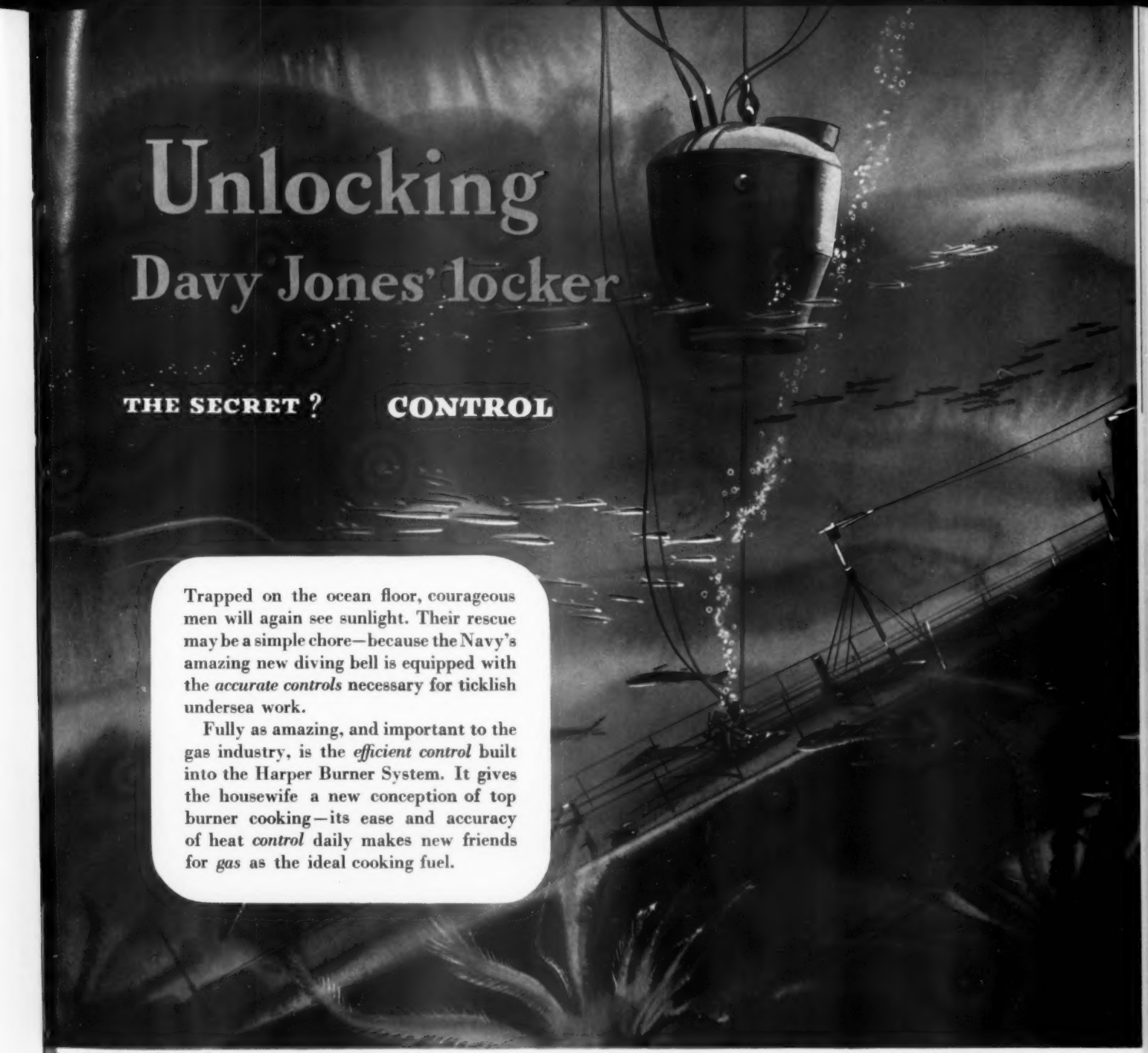
Norwalk Pressure Controller

This patented controller is designed for maintaining a constant gas pressure at locations where changing gas load is apt to affect the uniformity of control on standard types of weight-loaded or spring-loaded regulators.

With this unit it is claimed that steady uniform outlet pressure may be maintained in spite of variation in inlet supply pressure or gas volume. It is applied on industrial gas lines to maintain fixed supply pressure.

Pressure Controller

Details of application available through Norwalk Valve Co., South Norwalk, Conn.



Trapped on the ocean floor, courageous men will again see sunlight. Their rescue may be a simple chore—because the Navy's amazing new diving bell is equipped with the *accurate controls* necessary for ticklish undersea work.

Fully as amazing, and important to the gas industry, is the *efficient control* built into the Harper Burner System. It gives the housewife a new conception of top burner cooking—its ease and accuracy of heat *control* daily makes new friends for *gas* as the ideal cooking fuel.

Copr. 1940, Harper-Wyman Co.

CONTROL *is the secret here, too*

● The Harper Burner System is a patented invention whereby each of the burners on the range is actually 2 burners in 1 . . . a burner within a burner . . . both operated and controlled by a single handle.

This arrangement affords a high-speed STARTING BURNER to *start* foods boiling and for fast frying . . . plus a small, central, economical COOKING BURNER for *maintaining* the cooking. The COOKING BURNER can be used entirely independently of the STARTING BURNER. No other top burner possesses this vital advantage — which insures easy, accurate control: just the right heat for every type of top-burner cooking . . . every time.

HARPER-WYMAN COMPANY
8562 Vincennes Avenue, Chicago, Ill.

HARPER BURNER SYSTEM

HARPER BURNER SYSTEM

Demonstrates GAS at its best

SEE OTHER SIDE OF THIS PAGE

The "cook" comes out of the kitchen

Cooking time shortened by the

HARPER · BURNER SYSTEM ·

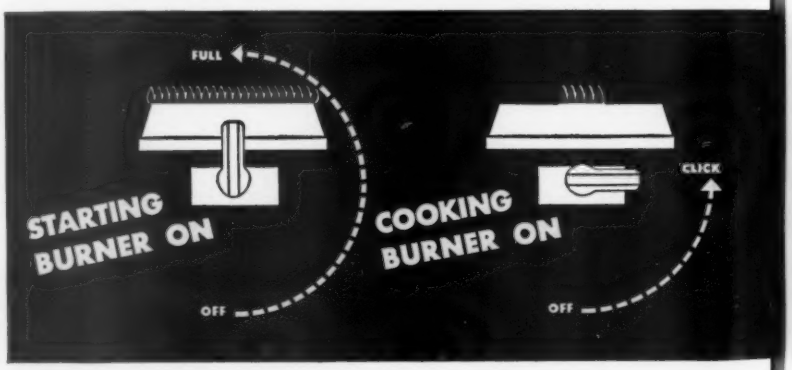
THE MACHINE AGE emancipated American housewives from much of the drudgery of kitchen work. It has more than halved the time formerly spent in *preparing* food for cooking.

Until the advent of the Harper Burner System, however, little had been accomplished in the matter of shortening the *cooking time.* Small wonder then, that women have been enthusiastic from the beginning about this amazing top burner system.

The Harper Burner System brought new, accurate heat *control* to gas cooking. This in turn made it possible to boil foods with a *cupful* of water instead of the customary *quarts*—without danger of scorching or burning. About 12 minutes are required to bring two quarts of water to a boil. A cupful takes less than 2 minutes. Ten minutes lopped off a kitchen operation that is repeated hundreds of times every year!

This is only one of many advantages that make the Harper Burner System supreme in top-burner cooking. These advantages have benefited everyone connected with the gas industry and have helped to maintain the position of *gas* as the nation's No. 1 cooking fuel.

The Harper Burner System provides a burner within a burner. The diagram below shows how the COOKING BURNER operates entirely independently of the STARTING BURNER. Yet both are controlled by the same handle.



We shall be glad to send you, without cost, two booklets that tell the complete Harper Burner System story . . . "Modern Methods of Top Burner Cooking" and "The Greatest Cooking Discovery in 40 Years". They should be valuable to anyone interested in the promotion of gas cooking and gas appliances. *Harper-Wyman Company, 8562 Vincennes Avenue, Chicago.*

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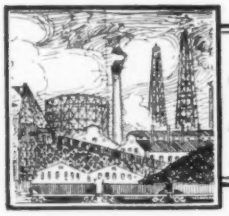
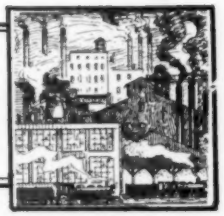
HARPER BURNER SYSTEM



News of the Gas Industry



Laboratories' Directory in New Form

One of the outstanding services of the American Gas Association Testing Laboratories is the publication of a complete directory of all gas appliances and gas appliance accessories certified by them. This directory serves as a reference guide to all interested in the purchase or sale of such equipment complying with national standards.

This directory is published quarterly in complete form as of January 1, April 1, July 1, and October 1, each such issue superseding all previous lists. Supplements to the quarterly directories are published as of the first of the 8 intermediate months. Appliances and accessories are indexed alphabetically in accordance with the type of gas for which they are approved.

To facilitate locating listing of various manufacturers' products, a manufacturers' index and a trade name index were added this year.

Another change consists of a new cover design, as well as colored covers for the quarterly directories. Illustrated on the outside cover are the 2 modern buildings which house the testing facilities of the Laboratories.

The January 1, 1941, issue of the directory contains over 17,000 individual appliances and accessories.

Edwin L. White Becomes V.P. of Laclede Gas Light Company

Edwin L. White, secretary-treasurer of The Laclede Gas Light Company, has been elected a vice president by the Board of Directors, it was announced on January 3 by L. Wade Childress, president.

White joined the Laclede organization in June, 1921, after nine years with the Missouri Public Service Commission. He served as general accountant until 1925, when he was elected comptroller and a director. He was named secretary-treasurer in 1932.

Midyear Sales Conference Pennsylvania Gas Assn.

The Pennsylvania Gas Association held their Mid-Year Sales Conference January 9th at the Hotel Benjamin Franklin, Philadelphia, Pa. The meeting was presided over by Mr. L. R. Leslie, Wilmington, Del., chairman of the New Business Committee. The delegates were welcomed by Mr. M. A. Boylan, V. P., Scranton Springbrook Water Service Co., Scranton, Pa. The first paper was entitled, "Chills and Fever," and was presented by Mr. Paul J. Naschold, Sales Manager, New Haven Gas Light Company, New Haven, Conn., and this was followed by a paper by Mr. P. F. Seiple, V. P., Jersey Central Power & Light Company, Asbury Park, N. J., entitled, "All Those in Favor Say 'Aye'." Mr. Seiple discussed the trial water heater plan which has been in effect in their company for some time and which has proved to be very successful. The company sold over 1000 water heaters in 1940 and a very large percentage of the sales resulted from the 60-day trial period.

The first paper after luncheon was by Mr. A. J. Maloney, General Sales Manager, Washington Gas Light Company, Washington, D. C., on the subject "Selling Gas Heating in the Nation's Capital." The session ended with A Fashion Parade of Gas Cookery. It consisted of a review of gas range progress in six tableaux. The accompanying illustrations show the 1840 and the 1940 tableaux. The attendance was about 200.

Gas Appliance Manufacturers Will Hold Exhibit

The Association of Gas Appliance and Equipment Manufacturers will hold an exhibition of gas appliances, accessories and equipment in the Municipal Auditorium, Atlantic City, N. J., the week of October 20, 1941, it has been announced by W. E. Derwent, president of the association and vice president of the George D. Roper Corp., Rockford, Ill. The exhibit will be held concurrently with the American Gas Association's 23rd annual convention being held during the same week.

Due to the prominent display of gas appliances and equipment at the Gas Industries Building at the New York World's Fair and at the gas pavilion at the San Francisco Golden Gate International Exposition, other exhibits were not held while the fairs were in progress. This will be the first national exhibit of gas appliances since 1936 and, with an estimate of over 200 manufacturers participating, it is expected that it will be the most successful ever held under the auspices of the gas industry.

The following are members of the exhibition committee: Lucian Kahn, chairman, Estate Stove Co., Hamilton, Ohio; H. P. Boncher, Dresser Manufacturing Co., Bradford, Pa.; W. S. Guitteau, Stacey Brothers Gas Construction Co., New York, N. Y.; F. J. Hoenigmann, Cribben & Sexton Co., Chicago, Ill.; George S. Jones, Jr., Servel, Inc., Evansville, Ind.; R. H. Lewis, Ruud Manufacturing Co., Pittsburgh, Pa.; Norton McKean, American Meter Co., Albany, N. Y.; H. T. Ryan, Robertshaw Thermostat Co., Youngwood, Pa.; R. E. Towne, Surface Combustion Corp., Toledo, Ohio.

THE FASHION PARADE OF GAS COOKERY—1840 AND 1941

Two of the six tableaux, demonstrating 1840 and 1941 styles in raiment and ranges. Keen eyes may discover the 1840 range (?) model. Dramatis personae:—left, Mary Pryor and George Schroder; right, Muriel Hopkins and Sol Weill.

Boston Consolidated Announces New Home Service Director

Miss Margaret P. Fossett, well-known to thousands of Greater Boston housewives, retired December 31, as Home Service Director of the Boston Consolidated Gas Company, after six years of service at that post. She is succeeded by Miss Susan A. Mack, who has had long experience with the Company.

Margaret P. Fossett

Susan A. Mack

Appointed director of the company's Home Service Department in September, 1934, after eight years as a lecturer, Miss Fossett brought an expert knowledge of modern gas cookery to this field and has contributed cooking information and assistance to many thousands of the Company's customers in personal contact and through her many lectures and cooking classes.

She is a member of the Zonta Club, the women in business section of the New England Home Economics Group, and the Evening Alliance Club of the Roslindale Unitarian Church.

Determination of Hydrogen Sulfide and Mercaptan Sulfur

Mellon Institute of Pittsburgh is distributing gratis to interested specialists a pamphlet by J. A. Shaw of its research staff that describes a method for determining hydrogen sulfide and mercaptan sulfur in admixture in gas.

By this procedure the sulfur is fixed by contacting it with a buffered cadmium chloride solution in a special flask. The cadmium sulfides formed are decomposed in an evacuated chamber with strong hydrochloric acid and the liberated sulfides are treated with a known volume of standard iodine solution in excess. The flask is opened to the atmosphere and the iodine is titrated with thiosulfate. This method is said to insure complete decomposition of the sulfides without loss of volatile compounds; it makes certain that there is contact of the hydrogen sulfide and iodine in a definitely acid solution.

The mercaptan sulfur is represented by the difference between iodine titrations of the total and of the hydrogen sulfide sulfur in samples taken concurrently.

Requests for copies of this publication should be addressed to Mellon Institute, 4400 Fifth Ave., Pittsburgh, Pa.

CONVENTION CALENDAR

February

10-12 *Southern Gas Association and A. G. A. Southern-Southwestern Regional Gas Sales Conference,* Hotel Adolphus, Dallas, Texas.

17-18 *A. G. A. Mid-West Regional Gas Sales Conference,* Chicago, Ill.

March

6-7 *Pacific Coast Gas Assn.,* Spring Sales Conference, Los Angeles.

13-14 *A. G. A. Industrial Gas Sales Conference,* Baltimore, Md.

17-18 *Oklahoma Utilities Assn.,* Tulsa, Okla.

27-28 *New England Gas Association,* Hotel Statler, Boston, Mass.

April

9-10 *Fourth Annual Midwest Power Conference,* Palmer House, Chicago.

14-16 *Mid-West Gas Association,* Hotel Nicollet, Minneapolis, Minn.

15-17 *Southwestern Gas Measurement Short Course,* University of Oklahoma, Norman, Okla.

21-22 *Gas Meters Association of Florida and South Georgia,* Hollywood, Fla.

21-23 *A. G. A. Distribution Conference,* Pittsburgh, Pa.

23-25 *Missouri Assn. of Public Utilities,* Elms Hotel, Excelsior Springs, Mo.

24-25 *A. G. A. Hotel, Restaurant and Commercial Sales Conference,* Chicago, Ill.

May

5-8 *A. G. A. Natural Gas Section Convention,* Adolphus and Baker Hotels, Dallas, Texas.

12-14 *Pennsylvania Gas Association,* Skytop, Pa.

19-21 *A. G. A. Production and Chemical Conference,* New York, N. Y.

20-21 *Canadian Gas Association,* Hamilton, Ontario.

22-23 *Natural Gas and Petroleum Association of Canada,* Hamilton, Ontario.

June

3-5 *Annual Convention A. G. A. E. M.,* Ambassador Hotel, Los Angeles, Cal.

September

8-10 *Mid-West Gas School and Conference,* Ames, Iowa.

11-12 *Empire State Gas & Elec. Assn.,* Saranac Inn, New York.

October

6-10 *National Safety Congress and Exposition,* Chicago, Ill.

20-24 *American Gas Assn. 25th Annual Convention,* Atlantic City, N. J.

Lyle C. Harvey Named 2nd Vice President of AGAEM

In order to aid in the expansion of increased activities, the Association of Gas Appliance and Equipment Manufacturers recently elected Lyle C. Harvey to the newly created post of 2nd vice president, it was announced by W. E. Derwent, president of the Association.

Lyle C. Harvey

Mr. Harvey, who is president and general manager of the Bryant Heater Company, Cleveland, Ohio, has been identified with the gas industry for the past two decades, particularly in the gas appliance field and is responsible for many innovations in the merchandising of gas heating and air conditioning appliances.

Mr. Harvey is also a director of the Dresser Manufacturing Company, Bradford, Pa., and is chairman of the Association's Committee on Laboratory Activities.

Gas Heating Campaign in Louisville, Ky.

During 1940 the Louisville Gas & Electric Company continued to place especial emphasis on the increased use of gas for residential and commercial heating, 414 gas residential central heating systems having been installed in Louisville, compared to 305 in 1939, and 274 commercial installations were made, compared to 168 the preceding year.

Throughout the year the Company carried weekly advertising in newspapers, picturing homes heated with gas, giving names of residents and actual heating costs. Economy of gas heating was indicated by showing various sizes and types of homes. The sale of unit heaters for commercial purposes was promoted by direct mail advertising. This program is being continued through 1941.

NATURAL GAS SECTION COMMITTEE LUNCHEON — HOTEL STATLER — ST. LOUIS, MISSOURI — JANUARY 6, 1941

Natural Gas Section A.G.A.

On January 6, the following Natural Gas Section committees met in St. Louis, Missouri: Executive and Managing Committees, Accident Prevention Sub-Committee, Industrial and Commercial Gas Sales Committee, Main Technical and Reseearch Committee and General Program Committee.

One of the most important matters discussed at the meetings was the program for the Natural Gas Convention to be held on May 5, 6 and 7 in Hotel Adolphus and the Baker Hotel, Dallas, Texas. The program for this 36th annual natural gas meeting has been fully outlined and, from the subjects and speakers selected for the various sessions and conferences, the natural gas man can be assured that his three days in Dallas will be packed with interesting and recent information on trends in the natural gas industry. It is again planned to use the symposium for subject presentation since this method guarantees a complete and open discussion of problems which face the operating man.

Speakers of national reputation in research, advertising, etc., are scheduled for the 1941 program. More detailed information about the program will be released at a later date.

Sale of Modern Ranges in Chicago Reaches New High

Peoples Gas Light and Coke Co., Chicago, announce that a new record in sale of modern gas ranges in Chicago was reached in 1940 with a total of 112,000. The figures for the past five years follow:

1936	55,000
1937	60,000
1938	61,000
1939	84,400
1940	112,000

The hearty cooperation of the hundreds of dealers in the Chicago district has aided materially in the constant growth each year.

Brooks Made President of Chaplin-Fulton

Alex M. Brooks was elected president of the Chaplin-Fulton Manufacturing Company, at the annual meeting of the company held January 16. The office became vacant last July, on the death of W. S. Ralston.

Alex M. Brooks

A grandson of M. B. Chaplin, one of the Chaplin-Fulton founders, Mr. Brooks is the third member of his family to hold a responsible position with the company. His own active connection began in 1930, on his graduation from Sheffield Scientific School of Yale University. He became treasurer in 1934, on the retirement of his uncle, W. C. Chaplin, and was elected vice president in 1937. His election as president becomes effective at once.

H. N. Ramsey Becomes P. A. For Philadelphia Electric Co.

The Philadelphia Electric Company, through its President, Horace P. Liversidge, announced the appointment of H. Nedwill Ramsey as Purchasing Agent in place of R. G. Rincliffe, who has been made Manager of the Station Operating Department.

Ramsey entered the service of the American Gas Company as Engineer in 1920, and later became assistant to the General Superintendent. In 1927 he became affiliated with the U.G.I., and in 1931 was placed in charge of Real Estate Operations for the United Engineers and Constructors, Inc. Since 1934 he has been President of the Welsbach Company.

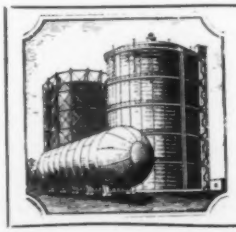
Pittsburgh Equitable Meter Co. Appoints Kint to Sales Force

The appointment of J. N. Kint to the sales force of the Pittsburgh Equitable Meter Company and Merco Nordstrom Valve Company has been announced by H. Boezinger, District Manager.

J. N. Kint

Mr. Kint will take over the sale of meters, valves, and other products manufactured by both companies to municipalities, water companies, and Federal and State projects within their Southern California territory.

For several years past, Mr. Kint has represented Worthington and several other manufacturers of mechanical equipment in the Los Angeles area. His new affiliation will be of interest to his many friends in Southern California.



STACEY BROTHERS

Gas Construction Co., Inc.

"STACEY-KLONNE" & TELESCOPIC GAS HOLDERS "STACEY BULLET" PRESSURE HOLDERS
PURIFIERS AND STEEL PLATE CONSTRUCTION

Executive Offices: Cincinnati, Ohio

Eastern Office: 21 West St., N. Y. C.

Industrial Gas Sales Conference

Once a year industrial gas men from coast to coast gather together expressly for two concentrated days of head-scratching about the industrial end of this gas business of ours. The American Gas Association Conference on Industrial Gas Sales will be held at the Lord Baltimore Hotel, Baltimore, Md., March 13 and 14th.

Lawrence E. Biemiller, Consolidated Gas Electric Light and Power Co. of Baltimore, Chairman of the program committee for the A.G.A. Industrial and Commercial Gas Section, promises sales ideas, promotional help, research reports, utilization information, data on new developments, and, of course, entertainment, all to the choosiest tastes of each utility executive, sales manager, industrial gas salesman or manufacturer who attends.

The whole schedule is listed under the banner slogan "Speed Defense Production with Industrial Gas."

Matters of organization, sales planning, promotional literature and rates will come up under a Symposium sponsored by the General Sales Committee of the Industrial and Commercial Gas Section on "Up-to-date Cooperative Sales Methods Between Industrial Departments and Equipment Manufacturers", with five industrial sales executives from various parts of the country participating.

No subject before the Conference will carry more significance than that selected by Charles M. Cohn, Executive Vice President of Consolidated Gas Electric Light and Power Co. of Baltimore, for his featured luncheon address on Thursday noon—"The Industrial Department's Responsibility to Management." And because they have proved themselves so valuable in the past, there will also be one afternoon fully devoted to committee-sponsored Round-Table Informal Discussions in three vital brackets: "Industrial Sales Managers Session", George F. B. Owens, Chairman, General Sales Committee; "Metal Treating and Melting Progress", Fred M. Reiter, Chairman, Metal Treating and Melting Committee; and "Gas Air Conditioning with Particular Emphasis on New Industrial Applications and Combination Installations", Charles R. Bellamy, Chairman, Joint Committee on Gas Summer Air Conditioning.

H. Carl Wolf, Chairman, and George F. B. Owens, Vice Chairman, A. G. A. Industrial and Commercial Gas Section, will preside. An old-fashioned Maryland Seafood Dinner, with music and an oyster opening demonstration in which conferees may try their skill at their own and their hand's risk, will be held Thursday evening. The Industrial Equipment Division of the Association of Gas Appliance and Equipment Engineers promises a Reception for Ladies and Gentlemen on both days at the Industrial Gas Equipment Club in Baltimore.

Paint Standards and Specification Catalog

A colorful and well prepared catalog covering paint systems, color standards and maintenance specifications has just been published by Paint Engineers Inc. of Hawthorne, New Jersey.

Comprising 64 pages, 8½ x 11, it covers the field of industrial and structural maintenance, including surface treatment, and methods of cleaning and application.

Over fifty typical Protechnic Systems are included comprising primers, intermediary and final coats. All coats and all colors are available in the type of vehicle most suitable to provide optimum results based on conditions existing.

Special sections of the book are devoted to straight aluminum finishes and partial aluminum formulations. The aluminum and other component pigments, as well as vehicles, are chromated, thus making available popular systems based on zinc chromate primers having corrosion inhibitive properties.

The latest development in protective finishes features a combination of leafing flake pigments representing optimum values in durability and appearance. The chemical resistivity of graphite, the indurated adhesion of mica and the reflectivity of aluminum are integrated to produce coatings possessing the intended characteristics. Graphalumica paints have repeatedly demonstrated that this effect has been achieved in finishes for oil tanks, gasholders, bridges and other industrial structures and equipment. It is a paint treatise, rather than a catalog. Copy is available to anyone writing on a business letterhead.

Pittsburgh Dealers Sell 4449 Modern Gas Ranges in Single Month

During last October the Natural Gas Companies Serving the Greater Pittsburgh Area (namely, the Equitable Gas Company, The Peoples Natural Gas Company and The Manufacturers Light & Heat Company), undertook their first dealer CP promotion and 4449 modern gas ranges, of which 460 were CP models, were sold during the month by the 514 cooperating dealers in 110 towns in the Greater Pittsburgh Area. Over 1500 retail salesmen were eligible for the contest.

A consumer contest was conducted in which entrants were instructed to complete, in 50 words or less, the statement "In selecting the perfect cooking appliance the Modern CP Gas Range gets my vote because— . . ." Dealer store traffic was built by requiring entrants to secure their entry blanks at independent dealers' stores.

A novel feature of the campaign was the "CP Shopper" who called at dealers' stores without revealing her identity and gave $1 to each salesman who, in her opinion, presented an adequate CP gas range sales story. This part of the promotion was designed to keep dealers and their salesmen on their toes during the promotion.

REED'S 4 WHEEL
Razor Blade Pipe Cutters

IDEAL FOR ANY TRENCH OR OTHER CLOSE QUARTER JOBS

$4.67 F. O. B. ERIE

Capacity
½" to 2"
Weight 5 lbs.

The REED FOUR WHEEL Cutter operates with a short back and forth motion through only one-third of a circle. Each of the four wheels exerts the same pressure on the pipe, and all 4 therefore cut evenly and completely through the pipe at the same time.

Equipped with Reed special alloy RAZOR BLADE Wheels, which cut with remarkable ease, leave little burr, and have a long life of useful service.

A sample cutter for test and trial may be ordered on memorandum invoice, to be paid for if retained or returned for credit if unsatisfactory. Try it once, and you will use no other.

REED MFG. COMPANY
1436 W. 8th Street • ERIE, PA.

York Ice Machinery Corp. Elects Officers for 1941

At the conclusion of York Ice Machinery Corp. stockholders' meeting on January 14th the directors met and elected the following officers to serve the ensuing year: William S. Shipley, chairman of the board; Stewart E. Lauer, president; Elmer A. Kleinschmidt, executive vice-president; Samuel J. Shipley, vice-president and treasurer; Llewellyn Williams, vice-president; and Vincent K. Keesey, secretary.

John F. Lebor was appointed assistant treasurer, and Donald M. Magor, comptroller.

Charles B. Jahnke Becomes Cooper-Bessemer President

The resignation of B. B. Williams as president of The Cooper-Bessemer Corporation, and election of Charles B. Jahnke as his successor, was announced December 28, following a meeting of the corporation's board of directors in Mount Vernon, Ohio.

B. B. Williams

C. B. Jahnke

Mr. Williams was made chairman of the board of directors, succeeding Dr. E. J. Fithian of Grove City, Pennsylvania, who resigned his position. The new chairman expects to continue in an active capacity as the head of the corporation. Mr. Jahnke, who has been vice-president and general manager for the past two-and-a-half years, will act as president and general manager and will serve as a member of the executive committee. Dr. Fithian, one of the founders of the Bessemer Gas Engine Company, and its president for several years, will continue as a member of the board of directors.

Mr. Williams reached his decision because of the importance of national defense work being done by Cooper-Bessemer and the necessity of his being absent often from the company's main offices.

Mr. Jahnke has been with The Cooper-Bessemer Corporation since 1935, having served two-and-a-half years as chief engineer and since July, 1937, as vice-president and general manager. He came to Cooper-Bessemer as a Diesel engineer, with an extensive background and training in engineering work with that type of engine.

Mr. Williams has been with the Cooper-Bessemer Corporation and its predecessor, the C. & G. Cooper Company, for forty years. In 1900 he joined the Cooper Company as a Sales engineer, and was made secretary in 1912. Four years later he became vice-president and general manager, and in 1920 was elected president, a position he retained when the Cooper Company was merged with Bessemer in 1929 to form the present corporation. He plans to retain an active voice in the company's affairs and especially in shaping its broad policies, while turning over to the new president the actual administrative and organization work, along with the executive powers of the presidency.

New Appointments In Florence Sales Organization

Henry H. Morse, vice-president in charge of sales, has announced several important changes in the sales organization of the Florence Stove Company, Gardner, Massachusetts.

H. E. Golden, formerly manager of the New York Division, becomes general sales manager. He has been connected with Florence sales for 14 years; three years as sales manager of the Mid-West division and for the past 11 years as sales manager of the New York division.

H. R. Singleton has been appointed assistant general sales manager. Mr. Singleton's 15 years' service with the Florence Stove Company has carried him through the sales departments in Chicago, New York and Boston.

R. H. Taylor succeeds Mr. Golden as manager of the New York division. Mr. Taylor formerly traveled the Iowa territory for Florence and for the past 4 years has assisted Mr. Golden in directing sales activities in the New York division.

INDUSTRIAL GAS BOILERS
GARMENT PRESS BOILERS
100 lbs. ASME Code
¾ to 45 H.P.

P. M. LATTNER MFG. CO.
MAIN OFFICE
CEDAR RAPIDS, IOWA

New Men Added to Roper Field Staff

Mr. Claude Vollmayer and Mr. Arthur Broderick have recently joined the Roper sales organization.

Arthur Broderick

Claude Vollmayer

Mr. Vollmayer will operate in New York state along with Mr. A. F. Jenkins. Mr. Broderick will work in New Jersey with Mr. Frank France and Roper Eastern Manager W. J. Foster.

Service Award Presented to William Reynolds of Servel

William Reynolds, of New York, advertising manager of Servel, Inc., received a special fifteen-year service medal from Louis Ruthenburg, president, at the company's mid-Winter sales conference held during the week of January 13 at the McCurdy Hotel in Evansville, Indiana.

In making the award Mr. Ruthenburg cited Mr. Reynolds for his excellent record and outstanding work during his fifteen years of continuous association with Servel.

At the meeting, company executives, department heads and regional sales managers discussed current sales and promotion plans.

Mr. Ruthenburg made the opening address. George S. Jones, Jr., vice-president and general sales manager, presided.

Harry A. Strong, of Oakland, Calif., executive vice-president; Robert J. Canniff, sales promotion manager, and Dolph Jansen, Jr., assistant sales promotion manager, were also on the program.

The regional sales managers attending the meeting were: B. O. Brown, of New York; Seward Abbott, of Dallas, Texas; C. A. Miller, of Oakland, Calif.; Roderic Peters, of Washington, D. C.; Grant Fink, of Chicago, Ill.; and R. C. Bon Seigneur, of Evansville, Ind.

Evansville executives of Servel in attendance were: George Roach, Hugh Cummins, P. B. Wiske, Carl Conkey, Norman Wooters, Miss Jane Tiffany Wagner, Gene McDonald, John Elton, Lyman Hill and J. K. Knighton.

Natural Gas Pipeline Co. of America, it is reported, is planning to enlarge the capacity of its main trunk line transmission system between the Texas Panhandle and Chicago, by the construction of five loops, which will total about 395 miles of 26 inch pipe. Four different contracts will be let for the construction of the five loops, it was stated. Bids will be called February 15th.

THE REPUBLIC HUMIDIFIER for HARD WATER AREAS

A self-cleaning model is now available.

Lime concentrates automatically discharged from evaporator at frequent intervals.

Every gas utility can now add this new and profitable load.

AUTOGAS COMPANY

2258 DIVERSEY **CHICAGO, ILL.** 8" x 15" x 25"

100 Pounds or More Cut to Medium or Low Pressure

Toggled Reducing Regulator

PRESSURES of 50 to 100 pounds or more in tanks or transmission lines are reduced to medium or low pressure for distribution by the Fulton Toggled Reducing Regulator. Can be equipped for accurate control of natural gas, manufactured gas, or by-product gas. For reversing furnaces, constructed with oversize valves. Ask for Circular 2573, also Catalog of C-F Regulators for all requirements of pressure control.

The CHAPLIN-FULTON MFG. CO.

28-40 PENN AVE. CF PITTSBURGH, PA.

A book for Every Gas Salesman

HOUSEHOLD GAS WATER HEATING

By Charles W. Merriam, Jr.

Nine chapters of the true essence of this subject.

CONTENTS

Engineering ABC'c
Water Heater Types
Hot Water—How Much?
Gas Consumption for Water Heating
Water Piping & Insulation
What Size Heater?
Automatic Heater Accessories
Competitive Water Heating
Hot Water—For What?

"A Book like this has long been needed to enable our salesmen to present a sound and convincing attack on this most worthwhile business of our industry."—A. M. Beebee, Gen. Supt. Gas Dept., Rochester G & E Co., Rochester, N. Y.

"A Real contribution to the gas industry."—R. A. Koehler, Chairman, A.G.A. Water Heating Committee.

Size 5" x 8", 142 Pages amply illustrated. Cloth Bound. Special Close-Out Price $1.00 a Copy.

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53 Park Place **New York**

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Sales Approach for Government Projects

(Continued from page 13)

Additional information that should be furnished in submitting your proposals:

How fast can you furnish the delivery system? This is important.

Will you furnish pipe lines within the camp boundaries?

Will you amortize this cost over a period of five years?

Will you need financial assistance?

Have you the facilities for installing the fuel system in a short period of time?

If you do not have funds available or if you feel that the installation does not warrant your paying the bill, state these facts clearly and state what the cost will be.

Do not fail to specify cost for various sizes of pipe per foot to the camp boundaries and specify cost per foot of the various sizes of pipe from your mains to the gas equipment. All of these items should be considered carefully and not overlooked, as the government departments need all this data to make a decision in favor of gas fuel.

I do not believe that politics go very far with the government departments, for they are interested only in data on speed, price, quality and production.

However, I repeat, it is good business policy to associate with a contact man in Washington whose job it is to spend his time finding out what projects are being contemplated and where they will be located. You are fortunate in being members of an association that supports such a service for its members and you should all take advantage of this opportunity.

CURRAN-KNOWLES GAS AND COKE OVENS

Strong reactive metallurgical coke is being produced in this Curran-Knowles plant from low volatile expanding coal **without blending.**

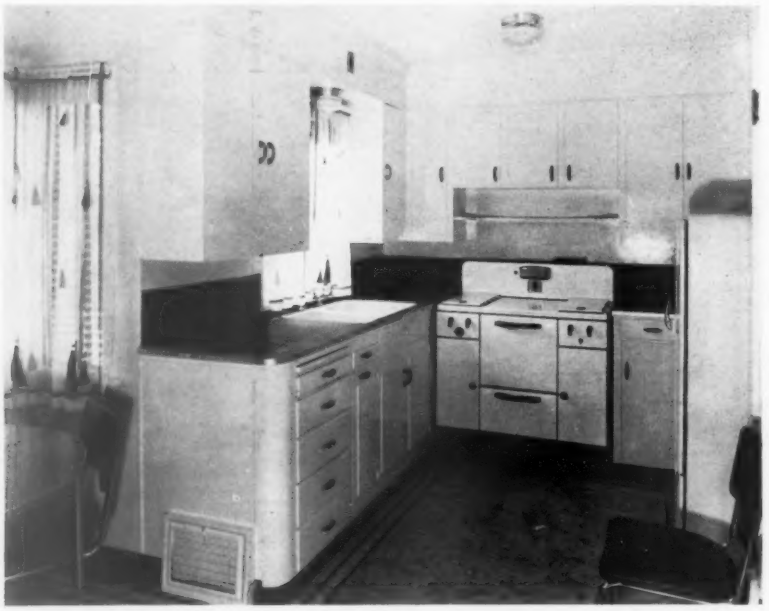
REACTIVE COKE

Is better for domestic and many metallurgical uses.

Coal Carbonizing Company

Bank of Commerce Building **St. Louis, Mo.**

Gardiner P. Bissell of Portland, Oregon, registers his approval as $250 first prize winner in the national amateur photographic kitchen contest. His winning photograph shown here is the all-gas kitchen of Life House No. 1 for 1940, built as an all gas equipped exhibition home at Lake Oswego, Oregon, near Portland. It is owned by Miss Margaret Castlio



PRIZE WINNING KITCHEN

This is the kitchen awarded the first prize of $250 in the recent Photographic Kitchen Contest sponsored by the American Gas Association as announced in our September issue. It was photographed by Gardiner P. Bissell, Portland, Oregon.

U-Shape in arrangement, this kitchen conforms to modern standards of efficiency. It is uncluttered with detail yet has plenty of eye appeal. The print also shows good composition, light and shadow are well handled, and the photography was considered tops among the amateurs, by the trio of judges, including Miss Elizabeth Beveridge, equipment editor, Woman's Home Companion, Miss Ruth Soule, home service director of a Brooklyn gas company and Robert W. Brown, camera editor, New York Sunday Times.

Winner of the second prize of $100 was Ross O. Major, Chicago, Illinois, and the $50 check for third prize went to Mrs. Lya Gray, New York City. Additional prizes of $5.00 each were won by 20 others throughout the country.

Bryant Names Three

The appointment of C. F. Cushing, as Sales Promotion Manager, D. E. Leslie, as Advertising Manager, and H. W. Heisterkamp as Manager of the Air Conditioning Sales Department has been announced by The Bryant Heater Company.

C. F. Cushing D. E. Leslie H. W. Heisterkamp

Mr. Cushing joined the Bryant Engineering Department in 1935 to assist in the development of Silica Gel Dehumidifiers. In 1938 he became Manager of Air Conditioning Sales. A graduate of Johns Hopkins University, Class of 1927, Mr. Cushing has spent more than a decade in the Air Conditioning field.

Mr. Leslie has been a member of the Bryant Staff since 1935. He is a graduate of the University of Minnesota, Department of Mechanical Engineering, Class of 1933. In 1935, he obtained his Master's Degree while doing research in Heating and Ventilating under Professor Rowley.

In 1935, he obtained his first business appointment as House Heating Salesman with the Minneapolis Gas Light Company. Later in the year, he joined Bryant's Engineering staff and shortly thereafter was appointed field representative of the Sales Engineering Department in the Eastern Territory.

Mr. Heisterkamp joined the Factory Engineering Staff of the Frigidaire Corporation immediately after graduating from the Case School of Applied Science, Class of 1931.

In 1933, he joined the Bryant Engineering Department in the development of Heating Equipment and Dehumidifiers. Later transferred to the Sales Engineering Department covering Dehumidifier field application, Mr. Heisterkamp traveled from coast to coast. As an expert on installation and an authority on Bryant's Silica Gel Dehumidifiers, he will assume the responsibility of tripling Dehumidifier sales for 1941.

Connelly Company Enlarges Manufacturing Facilities

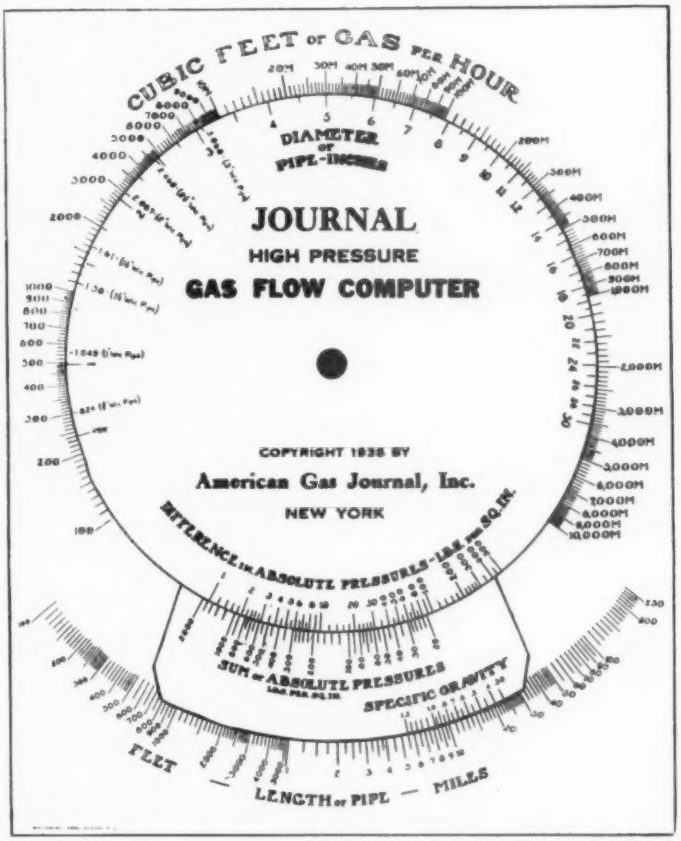
Connelly Iron Sponge & Governor Company, Chicago, Ill., and Elizabeth, N. J., announces extensive additions and improvements in its production facilities for the manufacture of governors, regulators, back pressure valves and other devices used in the production, distribution, control and consumption of manufactured and natural gas. In addition, contracts have been let for building a new laboratory and enlarged office space.

Mr. A. L. Smyly, president of Connelly, says that this expansion of facilities is due to greatly increased demand for their products since the engineering department radically redesigned the entire line about a year ago. There has also been a noteworthy increase in the number of gas companies availing themselves of their gas purification consulting service. This has required a new laboratory and enlarged facilities in the purification division.

Extensive plant facilities are maintained by Connelly both at Chicago, Ill., and Elizabeth, N. J.

HUGHES PRINTING CO.
EAST STROUDSBURG, PA.

"Journal" Gas Flow Computers



New Improved Gas Flow Computers now available of durable celluloid, encased in a convenient leatherette cover with complete instructions.

Actual Size 6¼ x 7½

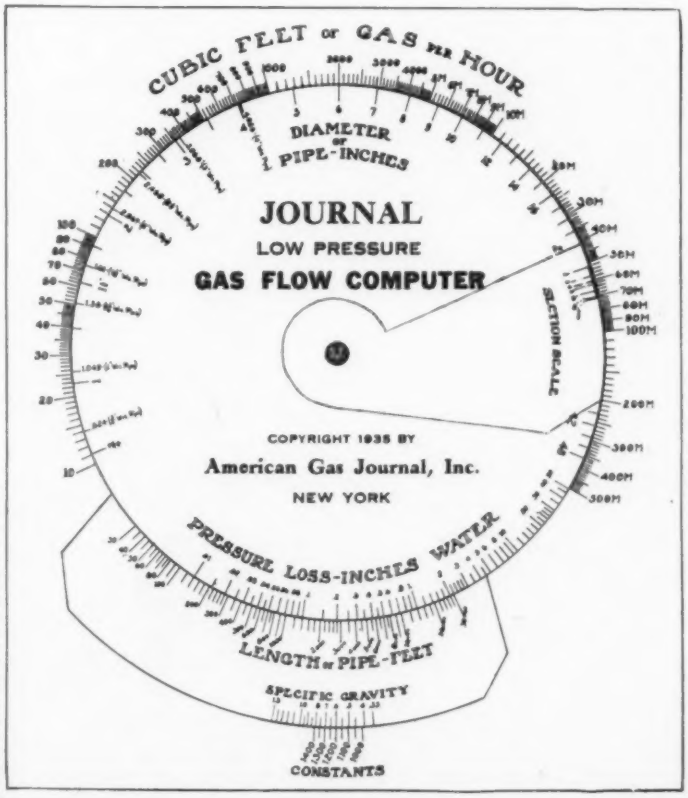
High Pressure Computer Range:

Cu. Ft. of Gas Per Hour—100-10,000 M
Diameter of Pipe Inches ¾-30
Difference in Absolute Pressure—Lbs. per sq. in. 1-500
Sum of Absolute Pressures—Lbs. per sq. in 2000-20
Specific Gravity 1.5-.35
Length of Pipe—Feet 100-5000
Length of Pipe—Miles 1-250

Low Pressure Computer Range:

Cu. Ft. of Gas Per Hour—10 to 500 M
Pipe Diameter ¾" to 48" (including standard and actual weight up to 4")
Pressure Loss Inches .01-10.
Length of Pipe—Feet 30-30,000
Specific Gravity 1.5-.35
Constants 1400-1000

Price $3.50 Each, Postage Prepaid



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53 Park Place, New York

Please enter our order for Computers as follows at $3.50 each, postage prepaid

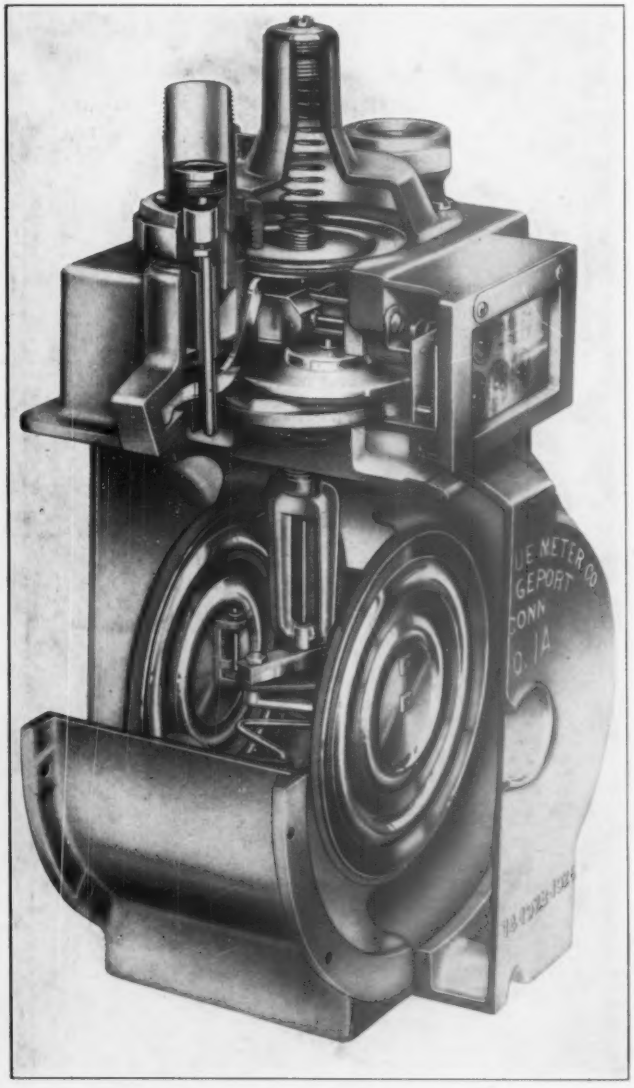
....HIGH Pressure Computer

....LOW Pressure Computer

NAME .....

ADDRESS .....

KEEP IN STEP
WITH THE LATEST DEVELOPMENTS



The Sprague No. 1A Combination Meter-Regulator

is a modern measuring device, offering you economy of installation and upkeep, unequalled accuracy and greater efficiency all in one unit, and the features which have been outstanding in Sprague Meters for so many years have all been maintained.

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